U.S. Department
of Transportation

LESSONS LEARNED

TURNKEY APPLICATIONS IN THE TRANSIT INDUSTRY

OCTOBER 1997

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Federal Transit
Administration

U.S. Department
of Transportation

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OCTOBER 1997

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	October 1997	Final Report

4. TITLE AND SUBTITLE
Lessons Learned - Turnkey Applications in the Transit Industry

5. FUNDING NUMBERS
TT872/U-8110

6. AUTHOR(S)
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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
U.S. Department of Transportation
Research and Special Programs Administration
John A. Volpe National Transportation Systems Center
Cambridge, MA 02142

8. PERFORMING ORGANIZATION REPORT NUMBER
DOT-VNTSC-FTA 97-11

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
U. S. Department of Transportation
Federal Transit Administration
Office of Research, Demonstration and Innovation
400 7th Street SW
Washington, DC 20590

10. SPONSORING/MONITORING AGENCY REPORT NUMBER
FTA-MA-90-8005-97-1

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
This document is available to the public through the National Technical Information Service, Springfield, VA 22161

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)
The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), Section 3019 included the provisions for the Federal Transit Administration (FTA) Turnkey Demonstration Program. The FTA is responsible through Section 3019 to develop turnkey guidelines based on the comparative cost and schedule differences between conventional and turnkey projects. To assist FTA in meeting this legislative requirement numerous outreach activities were initiated, highlighted by the International Transit Turnkey and Joint Development Workshop in San Juan, Puerto Rico on October 15-19, 1996. Co-hosted by FTA, the Transportation Research Board (TRB) and the Commonwealth of Puerto Rico, this five-day conference featured experts from around the world and explored the use of turnkey in transit project development and implementation. Under the direction of the FTA, six resource papers were produced addressing the core subjects of Financing; Project Management Control; Identification and Management of Risk; Value Engineering and Quality Assurance/Quality Control; Procurement and, Environmental Considerations. This report presents the full text of these papers and reflects the cutting edge of turnkey experience in public transit today. It is to serve as a benchmark against which to identify issues for further consideration in the Turnkey Demonstration Program and Congressional direction for issuance of guidance.

14. SUBJECT TERMS
Transit, Turnkey, Design-Build, Finance, Value Engineering, Quality Control/Quality Assurance, Procurement, Risk, Environment.

15. NUMBER OF PAGES
276

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	

EXECUTIVE SUMMARY

Turnkey is a promising project delivery system to help expedite schedule, control cost and better allocate and manage implementation risks. Furthermore, other potential benefits of turnkey deployment are more effective cash flow management, project control, partnering of small, medium and large-size firms, attraction of new sources of funding, and fostering use of innovative technology. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), Section 3019 included the provisions for the Federal Transit Administration (FTA) Turnkey Demonstration Program. FTA was authorized to select two or more transit projects that would participate in the Turnkey Demonstration Program. The projects selected are: Baltimore Central Light Rail Extensions, Los Angeles Union Station Gateway, San Francisco Bay Area Rapid Transit Airport Extension, New Jersey Hudson-Bergen Light Rail and, San Juan, Puerto Rico Tren Urbano.

The FTA is responsible through Section 3019 to develop turnkey guidelines based on the comparative cost and schedule differences between conventional and turnkey projects. To assist FTA in meeting this legislative requirement, outreach activities were initiated including: the Engineering and Procurement Turnkey Roundtable Seminar (February 1993); Transit Agency Senior Management Turnkey Roundtable Seminar (March 1993); Turnkey Finance Roundtable Seminar (April 1993); FTA/American Public Transit Association (APTA) Turnkey Evaluation Workshop (June 1993); Contracting and Finance Workshop (March 1994); Design and Construction workshop (May 1995), Value Engineering and Risk Management Workshop (February 1996) and, FTA initiated oversight and evaluation of the turnkey demonstration projects.

These outreach activities were highlighted in an International Transit Turnkey and Joint Development Workshop in San Juan, Puerto Rico on October 15-19, 1996. Co-hosted by FTA, the Transportation Research Board (TRB) and the Commonwealth of Puerto Rico, this five-day conference featured experts from around the world and explored the use of turnkey in transit project development and implementation. Under the direction of the FTA, six resource papers were produced addressing the core subjects of Financing; Project Management Control; Identification and Management of Risk; Value Engineering and Quality Assurance/Quality Control; Procurement and, Environmental Considerations. This report presents the full text of these resource papers and the following provides brief descriptions of each paper:

Part I, Turnkey Financing for Public Transportation Projects, examines institutional decision-making arrangements, the effect these arrangements have on project financing, private sector participation and the use of joint development to create revenue sharing and cost sharing opportunities. Risk management tools are presented for managing financial, political, and authorization and appropriations risk. The FTA process for advancing a project to a full funding grant agreement is presented and the points in the process where the public sponsor may consider a turnkey procurement are identified. Case studies are presented of five transit projects that are in various stages of implementation using a turnkey approach, as well as three relevant non-transit projects. This part concludes with observations regarding the U.S. and international experience with turnkey projects.

Part II, Project Management Control, examines project management control within the context of the turnkey projects included in the FTA Turnkey Demonstration Program and several conventional projects selected as comparison points. This paper documents the key issue areas encountered in project management for turnkey projects, describes the extent of control functions utilized and highlights the initial lessons learned in project management control for these first five turnkey projects. The areas of focus in this paper include:

- Identification of project management control as a key turnkey program issue of interest;
- Discussion of the organizational aspects of project management control within the turnkey environment;
- Identification of potential implementation issues regarding turnkey project management control and documentation of lessons learned and,
- Discussion of turnkey project management control within the context of FTA rules and procedures

Part III, Identification and Management of Risk on Turnkey Transit Projects, identifies all types of risk that relate to transit capital projects, describes the mechanisms that can be used to minimize and control each type of risk, explains how risks may be handled differently under turnkey procurement in comparison to traditional methods, determines an optimal allocation of risk among project participants, and identifies techniques to measure quantitatively the specific differences between the costs of risk for the turnkey demonstration projects relative to the appropriate counterfactual.

Part IV, Transit Turnkey Design and Construction: Value Engineering and Quality Assurance/Quality Control (QA/QC), explores three topics of design and construction – VE, QA/QC and contractor implementation freedom – from the perspective of both conventional and variations of turnkey implementation approaches. The purpose is to understand the issues involved and the incentives/constraints inherent in a particular implementation approach. Alternatives, as represented by the projects reviewed, and observations made serves as a source of guidance for those advancing major transit capital projects.

Part V, Transit Turnkey Procurement Lessons Learned, provides the background of various legislation at the various levels of government which allow or disallow turnkey as a procurement method. The paper provides documentation on the affects that turnkey procurement approaches have on contract packages, contract provisions, procurement processes followed, the variety of turnkey types used for the Turnkey Demonstration Program projects, as well as, accomplishments of federal, state and local Disadvantaged Business Enterprise (DBE) goals and programs.

Part VI, Environmental Considerations, discusses how environmental and community issues affect project planning and development, and presents ideas on how to proactively manage the environmental compliance process to capitalize on the flexibility and advantages of a turnkey approach while reducing the potential for major project risk factors to jeopardize successful project implementation. Based on experiences of traditional and turnkey projects during the project development process, major project risk factors associated with environmental issues are explored.

These resource papers reflect the cutting edge of turnkey experience in public transit today. This report, **"Lessons Learned - Turnkey Applications in the Transit Industry,"** provides the means for sharing the important findings of these resource papers and is to serve as a benchmark against which to identify issues for further consideration in the Turnkey Demonstration Program and Congressional direction for issuance of guidance.

LESSONS LEARNED
TURNKEY APPLICATIONS IN THE TRANSIT INDUSTRY
OCTOBER 1997

TABLE OF CONTENTS

PART I

TURNKEY FINANCING FOR PUBLIC TRANSPORTATION PROJECTS

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TURNKEY FINANCING FOR PUBLIC TRANSPORTATION PROJECTS

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ABSTRACT

The purpose of this paper is to address the impact of turnkey on project financing for transit investments. One of the primary benefits of turnkey is the acceleration of the project schedule to achieve timely project implementation. This aggressive scheduling creates revenue requirements to match construction drawdowns. The revenue requirements are generally not achieved through traditional funding which features yearly allocations under an FTA Full Funding Grant Agreement, matched with local share funds. While the sources of funds may not differ from traditional transit procurement, e.g. local option taxes, state grants, etc., the financing mechanisms must be structured to access larger amounts of capital in a compressed timeframe.

This report has the following major sections:

- Executive Summary which summarizes major findings.
- Issues and Opportunities Associated with Turnkey and Financing, which addresses institutional decision-making arrangements, the effect these arrangements have on project financing, and the financial participation in a turnkey project.
- Financing Issues, which addresses private sector participation in project financing and the impact of turnkey on project financing, including the use of joint development to create revenue sharing and cost sharing opportunities.
- Risk Management, which specifically addresses risk in terms of managing financial, political, and authorization and appropriations risk, by identifying risk management tools.
- FTA New Starts Planning and Project Development Process, which addresses the FTA process for advancing a project to a full funding grant agreement, and identifies the points in the process where the public sponsor may consider a turnkey procurement.
- Case Studies, which summarize five transit projects that are in various stage of implementation using a turnkey approach, and three other projects which document institutional arrangements, financing and risk management approaches.
- Conclusions, which provides observations regarding the U.S. and international experience with turkey projects.

EXECUTIVE SUMMARY

The following material provides summaries of the major findings from each section of the report:

Issues and Opportunities Associated with Turnkey and Financing

- The parties involved in a turnkey financing include; the sponsoring government agency(ies), an equipment manufacturer, a general contractor and associated professional firms.
- Financing a turnkey has the potential to bring the financial capacity of the private contractor into the process.
- The fundamental effect turnkey has on financing is in terms of the impact on cash flow to meet the requirements of an accelerated project implementation schedule.

Financing Issues

- The turnkey contractor is more likely to participate in construction financing then permanent financing.
- The turnkey arrangement must offer revenue opportunities from activities beyond transit, e.g., real estate development opportunities, toll facilities, to entertain private financing.
- Turnkey impacts the financing mechanisms which can be used to achieve the proper balance between the construction schedule and the available funds to meet construction drawdowns.
- Financing mechanisms are used to both create access to capital and for credit enhancement to reduce the cost of capital include the following:
    - Revenue bonds
    - Tax exempt commercial paper
    - Leveraged leases/certificates of participation
    - Cost sharing
    - Letter of credit
    - State infrastructure bank
    - Credit enhancement, e.g. provide financing for a debt service reserve fund
- The primary revenue sources to support financing will continue to rely on non-operating revenue sources augmented by benefit capture tools.

- Benefit capture opportunities, in the form of joint development, to promote revenue and/or cost sharing exist at rail stations, bus transfer facilities, intermodal terminals and fringe parking facilities.

Risk Management

- Financial risk relates to the basic economics of the project with respect to amortize debt and meet operating costs. Financial risk is managed through securing a full funding grant agreement from FTA, and putting local non-operating revenue sources in place.

- Political risk refers to the interaction of the project with its community environment and the effect this interaction has on project cost. It is best understood in the context of continuous opposition which slows project implementation thereby increasing the project cost.

- Authorization and appropriation risk refer to the fact that there are no guarantees that authorizations will continue from one Congressional Act to another, and that appropriations will be sufficient on a yearly basis to satisfy outstanding full funding grant agreements. These risks are managed, to the extent possible, by a contingent commitment by FTA to continue grants pending new authorization of Title 49 and Title 23.

FTA New Starts Planning and Project Development Process

- The FTA process is not well suited with respect to funding turnkey. The available funds to meet full funding grant agreements become stretched over a number of projects which adversely impacts project financing.

- A major issue with respect to turnkey is the point in the FTA process when the local sponsor proceeds with a turnkey rather than a conventional procurement.

Case Studies

- Five projects were reviewed that are participating in the FTA Turnkey Demonstration Program. Two of the projects are considering a tax exempt commercial paper program to match revenues to construction costs, a third is using a mix of long-term revenue bonds and certificates of participation, a fourth is soliciting private financing, and the fifth project is using pay-as-you-go financing.

Conclusions

- A comparison of turnkey projects in the U.S. and abroad demonstrates that the turnkey/BOT approach has been much more utilized in other countries. This results from several factors, including:
  - Availability of inexpensive tax-exempt debt financing in the U.S. for public infrastructure projects
  - Extremely limited public resources in other nations, especially less-developed nations
  - Extensive public requirements for competitive bidding procedures and contractual arrangements in the U.S.
  - Wariness of U.S. lending institutions toward supporting private infrastructure initiatives
  - Participation by international banking institutions such as the world bank and ifc in supporting infrastructure projects in less-developed countries.
- To facilitate the development of more turnkey projects, project sponsors must develop more opportunities for generating revenue for transit projects through innovative public-private partnerships and/or non-operating revenue.

ISSUES AND OPPORTUNITITIES ASSOCIATED WITH TURNKEY AND FINANCING

Private sector financing is a popular concept for financing public transit projects that has emerged in recent years. In a turnkey project, a public sponsor responsible for a transit system combines the design, construction and in some cases financing and operation of a transit project into one or several contracts so as to more effectively manage risk.

In many communities throughout the United States and around the world there is a major effort to more effectively allocate the risk of infrastructure projects between the sponsoring public agencies and private contractors who design and construct these projects. The theory driving the use of the turnkey approach is that risk should be allocated to the party more able to manage that risk.

Institutional Decision-Making Arrangements

The parties involved in a turnkey project financing include the sponsoring public agency(ies), an equipment manufacturer, licensed architect and engineering firm(s), a general contractor and associated specialty firms depending on the nature of the project. In addition to the skills necessary to design and operate a rail line, some turnkey projects are associated with real estate development or other activities linked to the rail project that can generate a revenue stream to assist in the project financing. These associated activities require professionals such as real estate developers, appraisers, real estate market analysts, urban planning and design specialists, financing and legal professionals, and environmental specialists.

The sponsoring agencies vary depending on the type of project being considered. In the case of interurban high speed rail projects, the public entity has most often been a special agency created by the state legislature to oversee the project. This agency, in turn, may rely on state government to provide assistance in reviewing project design, reviewing environmental impact statements, obtaining all necessary permits, monitoring construction, and providing general support from other agencies on an as-needed basis. The sponsoring agency also may contract out these assignments to the private sector.

Sponsoring agencies in intra-urban projects may include the Federal Transit Administration, transit agencies, commissions, regional governments, and/or a state, county or city government. They would use their own staff, or contract out to the private sector responsibility for the oversight functions required in a turnkey project. The ways in which the authority and responsibility for the oversight function are organized among government agencies is an important risk element for the private contractor that is discussed below.

The composition of the private partner and its legal structure is also variable. It may consist of a new company created for the project, a prime contractor or joint venture of existing companies, partnerships combining the real estate development and the rail project, or a combination of these approaches. In most cases an equipment manufacturer, usually the vehicle provider, plays a primary role along with the general contractor.

The legal structure of the private partner is important because it is the entity that the government sponsoring agency relies upon for any guarantees regarding completion of the project and revenue operations. The government sponsoring agency must be satisfied that the entity has sufficient working capital to prevent delays, has a good track record in the industry for completing similar projects on time and within budget, and has a reputation for settling contract disputes and change orders in a fair and efficient manner.

The sponsoring government agency is accountable to the elected officials that established the public policies allowing the project to proceed. They insure that the project complies with the legislation and other legal conditions that authorizes the government agency to sign a turnkey agreement. The authorizing legislation will provide guidance on the structure of the turnkey agreement.

The primary roles of the sponsoring agency are to select the private partner, negotiate a turnkey agreement, and monitor the progress of the project.

Effects On Financing

The institutional arrangements have specific effects on project financing. The project must advance through the FTA planning and project development process to be considered for a Full Funding Grant Agreement, (FFGA). While some rail projects have been implemented without any Federal funds, however, there still remains a heavy reliance on Federal funding. Federal funds typically result from annual appropriations that are not consistent with the construction schedule. The composition of the non-Federal funding (local share funding) generally is derived from the local sponsor and the State Transportation agencies. This funding varies greatly among the states, from New Jersey where the local share of the entire transit program is funded at the state level, to Texas, where the state, through enabling legislation, allows local jurisdictions to impose local option taxes using the revenues to financially support transit investments.

The project financing is ultimately dependent on the revenue base which supports the financing package. In cases where user fees are part of the revenue base, the elasticity of the fee structure on revenue capacity is an issue. For transit the issue of elasticity extends to non-operating revenue sources, such as dedicated local option taxes, which have a direct effect on the financing capacity to support project financing.

Financing a turnkey project with contractor participation brings the financial capability of the private contractor into the process. This creates a set of issues which if approached correctly may assist in bringing a financial package to the market, and in turn achieve market acceptance.

The private contractor's financial capacity and project performance are factors which rating agencies have considered in evaluating securities to finance transportation infrastructure. Of primary importance is the condition of the private contractor's balance sheet and recent income statements. These are regarded in the context of having the financial capacity to maintain an aggressive construction schedule toward successful project completion. The issue is one of maintenance of an adequate cash-flow position while awaiting progress payments. Contractor's

financial capacity is also at issue in those cases where the contractor has an equity interest in the project, which may be in the form of a note receivable. This type of vendor financing represents delayed profit taking which has a measurable effect on the income and working capital of the contractor.

Financial Participation in a Turnkey Project

One of the greatest benefits of turnkey projects are the opportunities they afford for private sector financial participation. These may include supplier financing of construction or equipment, either directly or through supplier-arranged loans or equipment lease/buybacks arrangements. Additional funding support may be tied to related land development, where rail transit projects create opportunities for real estate development around the station locations, i.e. transit oriented development.

A cautionary note should be sounded with respect to private participation with respect to transit financing. The conditions for soliciting private financial support must come from non-transit elements of the project. Frequently, this has suggested the super turnkey model, where the vendor receives real estate development rights as part of the procurement. Joint development, as a value capture strategy, has been available for conventional transit procurement and the success to date has been modest in terms of revenue that can support capital financing.

The fundamental effect turnkey has on financing is in terms of the impact on cash flow. Turnkey, by creating an optimum construction schedule, creates demands on cash flow to meet the drawdown requirements of a fast track construction schedule. This has implications for the types of financing mechanisms which are used to gain access to capital markets. The funding sources do not necessarily differ from a conventional procurement, which generally feature a mix of Federal grant funds, local participation, and state contributions from established fund sources or flexible funds transfers.

FINANCING ISSUES

This section addresses private sector participation in project financing and the impact of turnkey on project financing. To date, turnkey procurements that have been implemented in the transit industry have covered the following project elements; project management, design, documentation, fabrication, installation, utility relocation, construction, testing, training of personnel, and maintenance. These projects have been financed through the FTA new starts grant program and non-federal shares which has been raised from dedicated non-operating revenue sources or appropriations. Innovative financing mechanisms have been used to finance specific project features such as stations and rolling stock. Transit turnkey procurements have not widely tested the potential for private financing.

Project Financing

A discussion of project financing may be divided between construction financing and permanent financing. This distinction is useful since the financing of turnkey transit projects offers a different set of opportunities for each. The split of financing into construction and permanent reflects the financing structure of large real estate development projects. The construction financing is short-term in duration and carries an interest rate premium reflecting the lack of collateral offered by the project. Permanent financing is arranged at project completion, to take-down the construction financing.

Construction Financing

The issues regarding construction financing are formidable but are not necessarily affected by the nature of transit operations with respect to private market profitability tests. Construction financing by the private sector would require the local sponsor to take-down the construction financing with permanent financing. The reliance of future appropriations for the Federal share of project cost is a financial risk that would be borne by the local sponsor, since reimbursement of the entire construction financing cost would be guaranteed. The question arises, why would the local sponsor allow a private contractor to raise construction financing? Stated another way, what is to be gained from construction financing by the private sector contractor to the turnkey that generates more favorable results than traditional financing? The answer presumably lies in creating the financial capacity to achieve an optimum construction schedule. This fast track construction generally would result in project cost savings that arise from more efficient construction management and mitigation of inflation effects. The potential savings resulting from mitigating the effects of inflation are illustrated in Exhibit 1 for a $600 million project completed in three years rather than six years, assuming a five percent annual inflation rate. The cost streams in the Exhibit include only $600 million in construction value with an additional $180 million (30% of construction costs) allocated for project management.

As the data in Exhibit 1 show, costs in year of expenditure dollars are almost $65 million less for the fast track project. Other savings not quantified would result from the elimination of the soft

costs to implement a project over a longer time frame and more efficient construction management. The critical issue then becomes, whether these potential cost savings are greater than the construction financing costs of the private sector contractor and the risk assumed by the public sector sponsor.

The success of construction financing is dependent on what each party derives from the transaction. The turnkey contractor derives benefits from managing all of the design-build elements of the procurement; the construction financing is arranged to win the procurement. Presumably, the private contractor is "made whole" when the construction financing is taken down with permanent financing. Therefore, the contractor derives at least as many benefits from this procurement arrangement as one using traditional financing. Furthermore, if the turnkey procurement and construction financing are bundled, the advantages of turnkey make for superior profit potential for the contractor, which must offset any disadvantages of providing the construction financing.

Exhibit 1. Illustrative Project Costs Conventional vs. Turnkey Procurement (in $ millions)

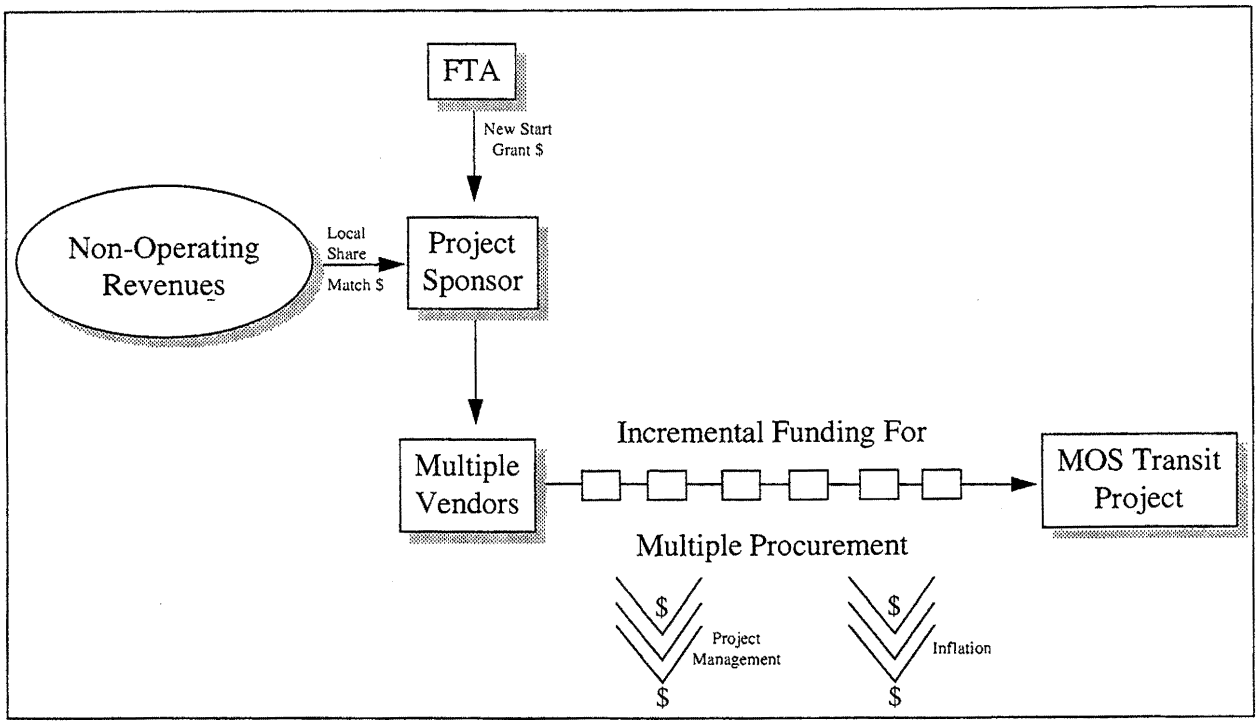
Year	CONSTRUCTION COST DRAWDOWN		PROJECT MANAGEMENT		COMBINED COST	
	Conventional	Turnkey	Conventional	Turnkey	Conventional	Turnkey
1	$100.0	$200.0	$30.0	$60.0	$130.0	$260.0
2	$105.0	$210.0	$31.5	$63.0	$136.5	$273.0
3	$110.3	$220.5	$33.1	$66.2	$143.3	$286.7
4	$115.8		$34.7		$150.5	
5	$121.6		$36.5		$158.0	
6	$127.6		$38.3		$165.9	
TOTAL	$680.2	630.5	$204.1	$189.2	$884.2	$819.7

Notes:
1 Analysis is based on a $600 million project in constant dollar terms.
2 Inflation is assumed at 5.0% per year to place costs in year-of-expenditure dollars.
3 Turnkey accelerates project implementation to 3 years from 6 years for conventional.
4 Project management is assumed at 30% of construction cost.

The local sponsor gets a project in the quickest amount of time. This is achieved through the turnkey procurement and construction financing which together accommodate an optimum project implementation schedule.

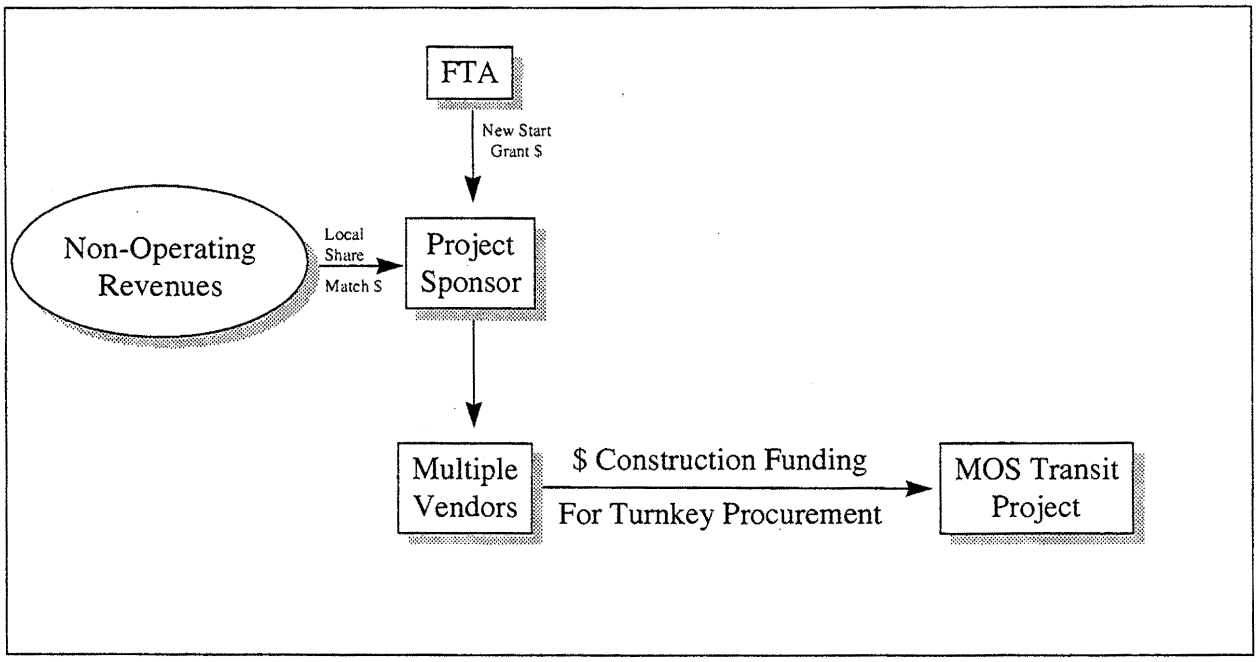
Exhibits 2 and 3 contrast the flow of funds for a conventional procurement to a turnkey procurement, respectively. From a financing perspective, the major differences relate to the incremental project implementation and financing under conventional procurement compared to a faster implementation of a minimum operational segment for a turnkey procurement. Exhibit 2 shows the added costs of conventional procurement stemming from extended project management costs and inflation. This graphically depicts the hypothetical financial results presented in Exhibit 1.

Exhibit 2. Conventional Procurement



Note: MOS refers to a Minimum Operational Segment of a larger transit project.

Exhibit 3. Turnkey Procurement



There do not appear to be insurmountable obstacles which would prohibit pursuing construction financing by the private sector as part of a turnkey procurement. The major issue is the financial risk that would have to be assumed by the local project sponsor with respect to the take-down of construction financing with permanent financing. If minimum operating segments of transit projects were implemented faster using a turnkey approach with construction financing substantial cost saving may be achieved.

Another potential benefit of construction financing by the turnkey contractor relates to matching the burden of transit investments to the benefits generated by the project. Using conventional procurement and traditional financing, the local financial support for the project must be generated as the project is being implemented. For example, in cases where local taxes are a primary funding source, the tax generally is levied years before the transit improvement reaches the operational phase. Thus, the burden is felt long before the investment generates any benefits. With construction financing, faster implementation allows earlier generation of benefits. These benefits come on line as the tax is levied, which promotes a clearer perception of the value of transit on the part of those who provide the non-Federal financial support. Private contractor financing is also important in cases where the sponsor is at its debt limit and diversifying financial risk to ensure a desired financial rating.

Permanent Financing

The prospects for permanent financing of transit projects by the private sector are limited. The private sector design-build contractor might be willing to make an equity contribution in the form of a note receivable representing a portion of profit from the project. This would not represent an equity interest in the project, rather it would be a delayed payment which would assist project financing.

Transit in the U.S. is an industry where pricing for services does not generate the revenue potential to attract permanent private financing. In the broader transportation industry, permanent private financing can be part of turnkey toll road projects because the investment offers upside risk potential. More traffic at stable tolls, or stable traffic at higher tolls boosts profit potential, which attracts a full turnkey package from private contractors of design-build-finance-operate-transfer projects. In contrast, the upside risk in transit operations is increased ridership. Pricing which is not intended to cover costs and increased ridership concentrated in peak periods (rather than off-peak) frequently require increased service levels which lead to widening operating losses. To attract permanent private financing, as part of a transit turnkey procurement, would require some incentive related to operations. This could take the form of bonus payments for increases above a target level of ridership that included achievement of a specified operating ratio. While some formula related to service could be developed to create upside risk, it would ultimately add to the subsidy requirements for transit service. This would exacerbate the primary problem currently confronting the transit industry, funding operations and maintenance.

Another issue with respect to permanent financing relates to interest costs. Private placement of debt for financing a large transit project would add significant interest costs compared to a tax

exempt offering. A possible way around this interest cost premium would involve a mixed offering of securities. The turnkey contractor would enter into a design-build-transfer-operate agreement with the local sponsor. The local sponsor would secure a portion of the permanent financing, presumably through a tax exempt bond issue. The turnkey contractor would secure the remainder of permanent financing, presumably through a taxable bond issue. The turnkey contractor would enter into an operating agreement with the local sponsor. Payments from the local sponsor under the operating agreement would be structured to meet debt service costs of the turnkey contractor up to an amount that would prevail for a tax-exempt issue. This implies that the turnkey contractor would require other sources of revenue to make an attempt at permanent financing a realistic option. This arrangement only makes sense if the turnkey contractor receives revenue from other activities besides operation of the transit project. Typically this could work in cases where significant real estate development opportunities were part of the turnkey. Then, in effect, the turnkey vendor is paying for marketable real estate opportunities to finance the transit improvement.

The extent to which a vendor can contribute to permanent financing will be determined by the opportunities beyond transit operations. In addition to the example of real estate development, is the potential offered by private development and operation of a multi-modal transportation corridor. This typically would involve a privately operated tolled facility which generates enough revenue to support permanent financing, and additionally generates surplus revenues that could be used to finance the transit elements of the corridor. An example would be a corridor that featured a high occupancy tolled system (HOTS) lane(s) financed and operated by a turnkey contractor, with "free" access to the HOTS lane(s) extended to buses and HOVs. This is a model for private financing of highway lanes that could accommodate, financially and operationally, express bus service and perhaps contribute toward a rail investment.

The prospects for securing permanent financing from turnkey vendors extends beyond transit. Essentially, the turnkey arrangement must offer revenue opportunities from activities beyond transit, such as real estate development opportunities or toll facilities, which would generate sufficient revenues to support private sector financing with the interest premiums of taxable rather that tax-exempt debt.

Financing Mechanisms

A turnkey procurement is normally linked to a optimum construction schedule (Exhibit 3). This is intended to result in placing the transportation infrastructure investment into revenue service in the shortest possible time frame. Minimizing the project implementation period is an action which lessens uncertainty. This has the effect of reducing risk and enhancing the prospects for project financing. It also impacts the financing mechanisms which can be used to achieve the proper balance between the construction schedule and the available funds to meet construction drawdowns. The obvious financing mechanism for turnkey as with conventional procurement begins with revenue bonds.

Revenue Bonds

Revenue bonds have been widely used to finance the non-Federal share of transit investments. Typically, revenue bonds are payable from specific sources of revenues, other than property taxes, and are not backed by the full faith and credit of the issuer. Revenue bonds are typically secured solely by a revenue pledge, by related covenants of the issuer to assure the adequacy of the pledge revenue sources, and sometimes by a mortgage on the facilities financed by the issuance of the revenue bonds. If the local sponsor has the financial capacity, generally demonstrated through the revenues generated from a dedicated local option tax, this form of financing may be structured for a turnkey as easily as a conventional procurement. The major difference is the quicker draw on funds with a turnkey, which has the impact of lowering debt capacity.

Tax Exempt Commercial Paper

Tax-Exempt Commercial Paper (TECP) is a short-term borrowing mechanism that provides the issuer with a high degree of flexibility in the amount and timing of borrowing money. TECP is used primarily as a construction borrowing vehicle that allows the issuer to fund cash flow gaps during construction periods. TECP has historically offered the lowest cost of borrowing. It does so by allowing the issuer to take advantage of the short end of the interest rate yield curve. Issuers authorize TECP programs in amounts large enough to meet the widest expected cash flow gap during the construction program. However, they only borrow or "drawdown" within their authorized amount that which is needed to meet any given period's cash flow gap. Issuers can borrow amounts for periods up to 270 days (30, 60, and 90 day draw downs are the most common), thereby benefiting from the considerably lower interest rates of those short-term maturities. At the end of the drawdown period, the issuer can either repay the amount drawn down plus the interest for that period, or it can "rollover" the borrowing for up to another 270 days at prevailing interest rates. There is no limit to the number of "rollovers" that can occur, and typically TECP programs can be maintained for several years. TECP programs are usually secured by a standby credit facility in the form of a line or letter of credit from a highly-rated commercial bank or banks. Investment banking firms, acting as TECP dealers, would administer the TECP program on behalf of issuers. Ongoing credit facility fees and dealer fees are paid by the issuer during the course of the TECP Program.

Leveraged Leases/Certificates of Participation

Certificates of Participation (COPS) is a financing instrument representing a right to buy cash flow rights, where the cash flows are the lease payments from the lessee. The main attractiveness of COPs from the standpoint of the local sponsor is that it allows for leased facilities and equipment to be paid for up front, the proceeds from COPs are used to pay off the lease in advance and then the investors in the COPs receive the payments from the local sponsor which include the principal and interest on the COPs.

COPs essentially are leases in that they are subject to annual appropriation and are used to finance tangible assets. The unique aspects of a Section 5307 supported security are the need for annual appropriations, as well as future Title 49 re-authorizations. However, Section 5307 can be a speculative source of revenue because it is subject to considerable year-to-year variation and there have been periodic attempts to reduce the transit program funds.

In December, 1990, the MTDB in San Diego issued the first COPs that were supported by future Section 9 apportionments. The $41 million raised by the 12-year securities were used to finance a bus acquisition. While Section 9 apportionments were used to pay installments on the COPs the market acceptance of the instruments was gained through the pledge of sales tax revenues and the significant cash reserve from MTDB's capital replacement reserves.

ISTEA legislation enables transfers of Federal Highway funds to the Federal Transit Administration (FTA). This provision offers State DOTs the opportunity to leverage future highway appropriations, the proceeds of which may be directed to holders of the COPs.

Cost Sharing

As documented in several foreign examples, projects that contain both highway and transit elements are able to generate toll revenues and greater opportunities for real estate development. These revenues may be used to pay debt service on capital costs and/or operating expenditures for a turnkey or BOT project. In both the Dartford Crossing project in England and the Sydney Harbour Tunnel project in Australia, existing toll bridges or tunnels were made available to the project company by the government so that the tolls could be used to finance the new project. Likewise, in the case of the North-South Expressway project in Malaysia and the Bangkok Second Stage Expressway project in Thailand, toll revenues from existing toll roads were made available to the project company.

In the United States, this strategy could be employed in projects in which a transit facility is adding capacity to an existing corridor. In addition to providing a source of revenues, the pricing of each facility could encourage more efficient utilization of both facilities. Packaged highway/transit projects open opportunity for greater range of public and private funding sources by contributing funds for debt service.

Multimodal projects also enhance opportunities for vendors to assume turnkey risks and participate in project funding. In any conventional system procurement, the owner is obligated to assume the risk associated with coordination of the integration of the different components, as well as the risks and uncertainties with overall system performance. As the project company assumes more responsibility with additional components of the project, the risks are shifted to the contractors, who have a much greater incentive to assure that the completed system will operate reliably and will be designed to minimize operating and maintenance costs.

Letter of Credit

In some situations, a commercial bank may directly support a transit agency's financing with an irrevocable direct pay letter of credit to lower the cost of the agency's borrowing on the tax-exempt markets. A transit agency may decide to obtain funds for purchasing equipment through the sale of tax-exempt debt financing through revenue bonds, or a TECP. The bonds will have a credit rating based on the revenues pledged to pay debt service and other credit factors. The rating can be enhanced and interest costs lessened by supporting the borrowing with a letter of credit.

In a letter of credit supported issue, a commercial bank provides the funds for payment of principal and interest on the bonds in the event that the issuer does not make the debt service payment to the noteholders. The noteholder, therefore, relies on the credit of the commercial bank for its principal and interest payments. A letter of credit is used to raise debt to investment grade. For debt issued at AAA or AA, the cost of a letter of credit most likely far outweighs any benefits to the offeror.

State Infrastructure Bank (SIB)

Under ISTEA, states may provide loans or other forms of credit enhancements utilizing a state's federal funds. The state can provide simple or leveraged loans through a State Infrastructure Bank (SIB), which functions as a state-level revolving loan fund. Federal funds can be used as seed capital or equity, and other non-federal funds can also be transferred directly into the bank. The bank could make loans to private project sponsors for any revenue-generating transportation project. After being repaid to the bank, the funds from the loan payments may be re-loaned to other projects. The revolving loan fund will grow in size as principal and interest payments are accumulated.

Through a SIB, a state can use its initial capital (provided by its Federal-aid highway apportionment, Federal transit allocations, and non-Federal funds) to provide loans and for a variety of other financing arrangements. Activities by a SIB include financing arrangements to provide credit enhancement, serve as a capital reserve for bond or debt financing, subsidize interest rates, issue letters of credit, finance purchase and lease agreements, provide debt financing security, or provide other forms of financial assistance for construction of projects qualified under the Federal-aid highway program and transit capital projects. As the funds are repaid or compensation is provided, the SIB can make new financial assistance available to other projects, continually recycling and leveraging the initial funds available.

A leveraged loan fund increases its available resources by using the loan repayment stream and/or the initial capital base as collateral for a bond issue. The state leverages these funds by placing the seed capital into a reserve fund, and then issues bonds against the fund, potentially tripling the amount of money it is able to lend. When repayments from the revenue-generating facility are repaid, these funds will go into the reserve fund and used to leverage more funds for the bank. However, leveraged funds may need to rely on the government's credit rating and backstop revenue sources to secure a bond rating high enough to permit loan offerings at

affordable terms. Exhibit 4 presents a typical structure of a leveraged loan program through a state infrastructure bank.

Capital for revolving loan funds can be assembled from several sources, including dedicated taxes and user fees, governmental grants, legislative appropriations, bond proceeds, loan repayments, interest earned from loan operations, and interest on cash balances. The capital base of the revolving loan fund may be designed either to remain self-sufficient during its lifetime, or to require future infusions of funds from external sources to remain operational.

The terms of repayment for the loans may also vary to match the borrower's profile, including the interest rate, term of the loan, percentage of costs financed, payment schedule, and grace period.

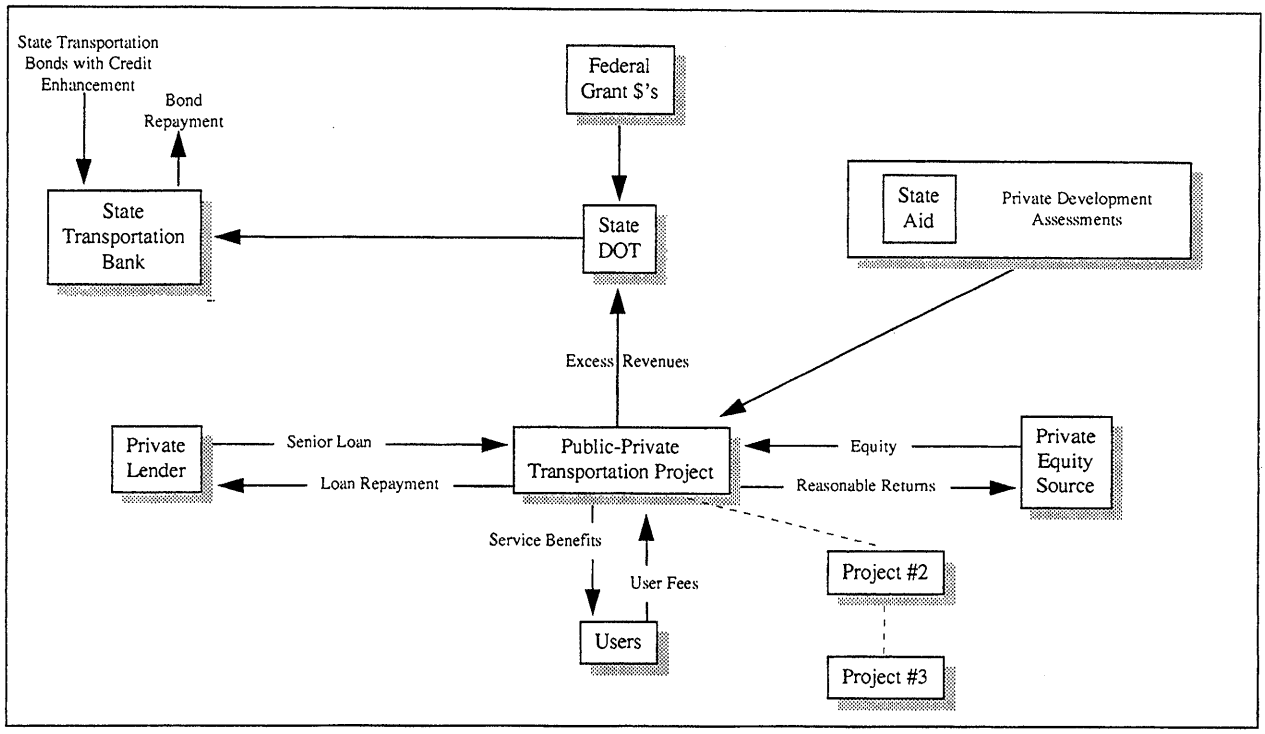
SIBs can provide a flexible source of financing for privately-sponsored transportation projects. These mechanisms provide more capital for transportation projects with less reliance upon federal apportionments. In a turnkey or BOT project, the project company could receive a loan for a portion of the cost of the project, and repay the loan through revenues generated by land development, lease payments, payments from operating agreements, or fare revenues.

Credit Enhancement

The private sector contractor could provide credit enhancement to a financing placed by the public sponsor of the project. Credit enhancement adds to the marketability of securities in a financing, and generally lowers the interest cost on debt. In this role the private sector vendor could offer credit enhancement assistance in forms envisioned for SIBs, to include the following:

- Provide financing for a debt service reserve fund;
- Provide debt financing security;
- Secure or issue letters of credit;
- Finance lease agreements;
- Subsidize interest rates.

Exhibit 4. State Infrastructure Bank Leveraged Loan Program



Some of these credit enhancement arrangements are more appealing than others. A contractor with available working capital could escrow funds for a debt service reserve fund and earn interest on the fund balance. Unless the issuer defaulted on the debt, this would amount to a low cost form of private financing participation. Similarly, a contractor with available working capital could provide debt financing security for a portion of the debt over a limited time period. This would heighten the security of the debt, and absent default would not impose direct costs on the private contractor. This arrangement would be similar to issuing a letter of credit, in that it is an off-balance sheet transaction which is a pledge of assets in the event of default but may not encumber the assets. The financing of lease agreements could be affected through a sale-leaseback transaction, with the private sector contractor holding ownership of the asset, which is leased to the public sector end-user. The tax savings gained through depreciation provide the basis for creating the transaction. It is difficult to foresee any arrangement where the private sector vendor would subsidize, i.e., buy-down, interest rates. This would require a pure cash transfer, which would be an out-of-pocket cost to the private sector contractor.

To illustrate the potential importance of credit enhancement, a reduction in the interest rate of one-percent (100 basis points) results in debt repayment savings of $55,420 per year for 20 years on each $1 million debt financed. For a $500 million project this represents yearly savings of $2.8 million over the 20 year repayment period for a level debt revenue bond. This represents a net present value savings of $30 million assuming a seven percent discount rate. Using this same example, if the private sector vendor provided the funding for a debt service reserve fund, it would reduce the debt offering for a $500 project by approximately 10% or $50 million. This

would result in yearly debt repayment savings of $4.7 million per year (assuming a 20 year revenue bond at 7%, level debt).

The potential importance of credit enhancement is amplified by the magnitude of project costs financed through debt. Relatively small reductions in interest costs e.g., one-percent, or a reduction in debt load, e.g., 10%, result in substantial recurring savings, as discussed above.

Funding Issues

A critical issue regarding the market acceptance for financing transportation infrastructure investments is the operating history of the industry. Ideally, there exists a number of successful projects which demonstrate the capacity to support debt. The primary examples in the transportation industry are tolled facilities, which also may be supplemented by benefit capture tools featuring benefit assessment or tax increment financing districts. For the transit industry, the primary revenue sources to support financing will continue to rely on non-operating revenue sources featuring established forms of public support, e.g. local option taxes. These could be augmented by benefit capture tools, which given a robust real estate market could be relied upon to lessen reliance on public support. In these cases, the public support would remain in place to provide back-stop financing to securitize the debt.

The relationship of funding sources and financing mechanisms is represented in Exhibit 5. Capital requirements are the cost of the transit project. Financing mechanisms provide the access to capital markets to finance project costs. This is a typical requirement for a long-lived asset which can not be acquired through pay-as-you-go financing. Once the financing mechanism is implemented funding options must be in place to meet debt payments. For the transit industry, this requires funding packages consisting of non-operating revenue sources. This relationship is not likely to change in the foreseeable future since transit is priced to relieve congestion and enhance mobility rather than meet private market profit tests.

The range of funding options to support transportation infrastructure financing is depicted in Exhibit 6. Because rail transit aids in reducing congestion and enhancing mobility it may be argued that such service confers benefits on land parcels which are located at or near station sites. The rail transit component enhances the ability of benefited locations to become activity centers. This adds market value to the effected properties through enhancing the desirability of the transportation advantaged location and as a transportation node, the collections of people enhance the prospects for commercial opportunities.

A prime objective in funding transit investments is to pursue benefit capture strategies. While benefit capture probably can not be relied upon to fund the entire transit investment, it is worth considering as a strategy to be part of the local share and/or to lower project cost. The following material discusses joint development with reference to rail transit projects. While these opportunities are not necessary unique to a turnkey procurement, turnkey arrangements can be structured to include joint development components which may be incorporated into the bid process.

Exhibit 5. Project Finance

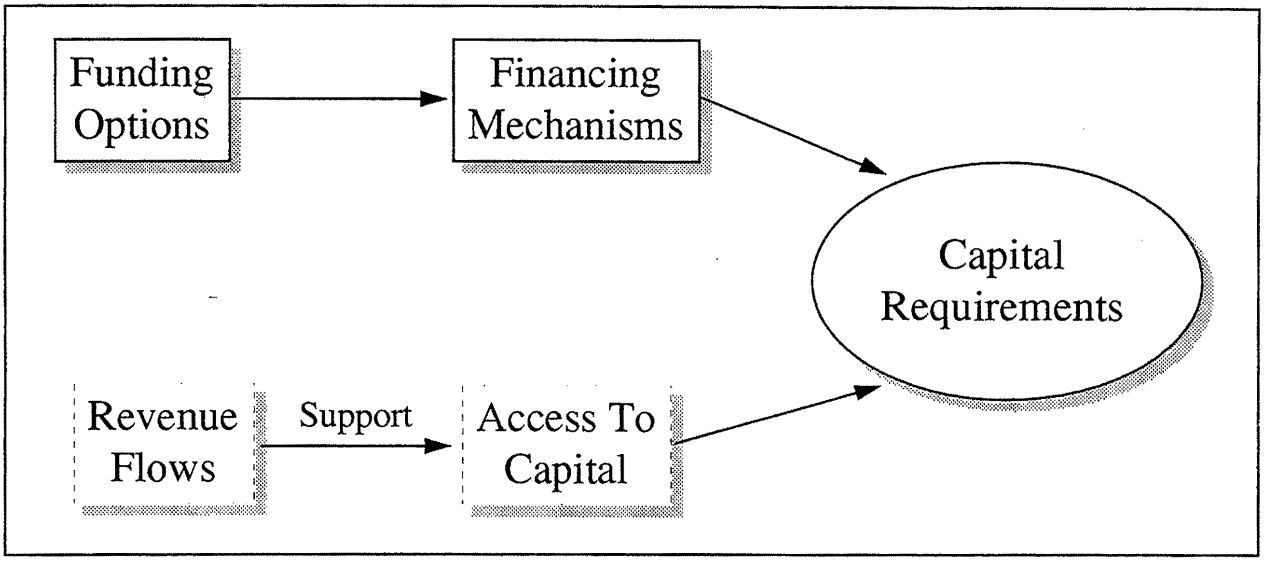


Exhibit 6. Range of Funding Sources

Beneficiary	Source	
Riders	Farebox	Bulk Sales
Property Owners	Property Tax Special Benefits Assessments Impact Fees	Joint Development Fees Mortgage Recording Tax Transfer Tax
Businesses	Employment Tax Business Use Tax	Income Tax Hotel/Motel Tax
Vehicle Owners	Gas Tax Parking Tax	Vehicle Registration Fees Traffic Fines
Public Agencies	City General Fund State Appropriation	FTA
Residents	Sales Tax	Wage Tax
System Vendors	Advertising Revenues	Concession Revenues

Joint Development

Recent efforts of public/private partnerships involving transit have focused on joint development activities. Many of these activities have leveraged private investment in locations around fixed guideway transit facilities to fully exploit the market and locational advantages provided by transit. Opportunities for joint development exist at rail stations, bus transfer stations, intermodal terminals, and fringe parking facilities.

A public-private joint development partnership produces synergistic benefits beyond capital formation. Among them are:

- Joint development of commercial centers or high density housing adjacent to the facility promises expanded ridership for the transit agency and stronger tenants for the development project;

- The close proximity of the transit facility can justify reduced parking requirements;

- Joint development increases efficiency in the assembly of land and other resources for both projects through the potential to apply condemnation powers, arrange land swaps, and transfer air and development rights;

- Joint development facilitates master planning of the area using techniques such as the specific plan area, benefit assessment district, or special fee district;

- Transportation funding depends on generation of matching funds form the local agency. Private participant contributions to public-private partnerships may qualify for matching fund treatment.

Considerable confusion exists over what constitutes joint development. For purposes of this report, joint development is defined as: any formal agreement of arrangement between public transit agency and a private individual or organization that involves either private sector payments to the public entity, or the private sector sharing transit project capital costs in recognition of the enhanced real estate development or market potential generated by proximity to a transit facility.

This definition essentially describes two classes of joint development strategies: 1) revenue sharing arrangements; and 2) cost-sharing arrangements. Joint development is also used to increase ridership through higher density land use. From a financial perspective, joint development can be framed in terms of a financial accounting, where some initiatives effect the revenue side, while others relieve transit agencies of some of the cost burden of constructing, operating, maintaining, or rehabilitating transit systems.

Joint Development Strategies

Developer participation as part of public/private joint development has historically varied in quantity, kind and value. Empirical evidence has shown that in the U.S. about 40% of the joint development projects involve cost-sharing, 25% involve revenue-sharing, and 35% involve some combination. Below, the possible forms of joint development are listed under "Revenue-Sharing" and "Cost-Sharing."

Revenue Sharing

- **Leases:** The transit agency or local government leases land parcels, air or subterranean rights, or unimproved space to private developers or commercial tenants. In the U.S., this is the most common form of joint development.

- **Facility Connection Fees:** A fee is collected from a landowner or private tenant for the right to physically connect a project, usually a retail store or office building, to a transit station park-and-ride facility via a passageway.

- **Benefit Assessment Districts:** These are specially designated districts around transit stations, for which benefiting landowners pay assessment fees for proximity. The fees can help finance capital projects though they are most appropriate for funding operating deficits.

- **Tax Increment Financing:** Under this approach, the property tax base for benefiting property owners is frozen at a certain point in time. Incremental gains in property tax receipts are earmarked for securing capital obligations or funding operating deficits. Like special assessment revenues, tax increment revenues are weak security devices almost totally dependent on the local real estate market.

Cost Sharing

- **Voluntary Agreements:** These are agreements between transit agencies, developers, and private property owners that reduce the development costs of each party through coordinated planning, design, and construction. Examples include; shared parking facilities, ventilation, heating and cooling systems, and land assemblage and purchase.

- **Incentive-Based Agreements:** Under this form, public agencies grant real estate developers development bonuses (e.g. higher floor to area ratios, FAR's) in exchange for partial or full funding or other on-site public infrastructure. This infrastructure may include pedestrian amenities, stations, transfer centers, and waiting areas.

- **Mandatory Programs:** Where such programs exist, developers building in a designated area may be required to provide transit facilities and services as traffic mitigation measures of their development projects.

Considerations for Project Implementation

Bringing a joint development project from the idea stage, to the concept stage, to the implementation stage is not always easy. Below are some of the common considerations which may require attention and serve as useful check points in evaluating candidate projects.

- **Establishing the relationship between an existing or planned transit facility and a real estate development project:** This step is typically not done or when it is done, it is not done

very well. One of two types of problems are experienced in this area; either travel demand forecasting models are not sensitive to site specific conditions, or the economic linkage is not established sufficiently.

- **Coordinating the site and functional plans of the two facilities:** Because access is so important to overall success, care must be taken that these plans are prepared. It is important that the real estate development or commercial aspects are viewed as activities which do not detract from mass transit use, and are thus defined as incidental uses.

- **Determining the market and financial feasibility of the real estate development project:** If a developer is seriously considering a proposal, then a market and financial feasibility of the total real estate project will be conducted. If a transit agency is the initiator, the agency will typically depend upon the bidders assessment of market and financial feasibility. A less risky approach has the transit agency performing its own studies. This includes conducting due diligence of the private developer, such as analyzing the financial capacity of the developer.

- **Negotiating and integrating the design of the transit facility and development project:** In many instances, consensus is presumed on integrated designed projects. More typically, separate designs are developed because the developer and the transit agency operate on separate uncoordinated schedules.

- **Documenting property owner agreements:** A property owner agreement is needed in cases where land is not owned by either transit agency or developer to ensure that eminent domain power will not be used. It is surprising that these agreements are usually developed late in the process after many of the key decisions are made singularly by either the transit agency or developer.

- **Satisfying environmental review requirements and local zoning ordinances:** Problems in this area will emerge at the grant application processing stage, if a Categorical Exclusion was not issued, an Environmental Assessment or an Environmental Impact Statement was not prepared, Finding of No Significant Impact or a Record of Decision was not recorded, or a zoning review was not completed.

- **Conducting a competitive bidding process when the transit agency or local government owns the land for the joint development project:** Public perceptions of impropriety with development proposals are ever present and Federal third party contracting requirements must be met when FTA supports a joint development project.

Federal Considerations

Lastly, in those projects where Federal Funding is requested, various requirements must be met. The major Federal requirements which need to be adhered to implement a joint development project are set forth in Appendix B of the FTA's recent circular "Capital Program Grant Application Instructions."

Joint development projects are commercial, residential, industrial, or mixed-use developments that are induced by or enhance the effectiveness of transit projects. Joint development projects include private, not-for-profit, and non-profit development activities usually associated with fixed guideway transit systems that are new or being modernized or extended. Joint development projects can be also be associated with intermodal transfer facilities, transit malls, and Federal , state or local investments in existing facilities. Capital Program funds may be used to facilitate private development that enhances transit; they may not be used for purely private development such as construction and permanent financing costs related to the design and construction of retail, residential, or other commercial public and private development such as construction and permanent financing costs related to the design and construction of retail, residential, or other commercial public and private revenue-producing facilities.

- **Requirements.** A joint development transportation project must have the following characteristics:

  - It includes a transit element; and

  - It enhances urban economic development or incorporates private investment including office, commercial, or residential development; and

  - It enhances the effectiveness f a mass transit project, and the non-transit element is physically or functional relate to a mass transit project; or it creates new or enhanced coordination between public transit and other forms of transportation. Or,

  - It includes nonvehicular capital improvements that result in increased transit usage, in corridors supporting fixed guideway systems.

- **Physically Related.** A project is physically related to a transit project if it provides a direct physical connection with transit services or facilities, including projects using air rights over transit stations or projects built adjacent to the transit station.

- **Functionally Related.** A project is functionally related to a transit project if it is related activity and use and it is functionally linked (with or without direct physical connection) to transit services or facilities. Also, a project is functionally related to a transit project if it provides a beneficial service to the public (or community service) and enhances usage or access to transit. Functional relationships must not extend beyond the distance most people will reasonable walk to use a transit service. This distance is estimated to be approximately 1500 feet. The eligible project area for a functionally related project will be identified by the grantee in consultation with FTA's Regional Office on a case-by-case basis.

- **Eligible Costs For Joint Development Projects.** Eligible project costs for joint development projects include, but are not limited to, the following:

  - Site design, engineering, and environmental analysis as appropriate.

  - Real estate packaging for specific joint development project including preliminary design and engineering, estimates of operating income and expenses and capital costs; and negotiations to secure financing, developers, and rime tenants.

- Land acquisition, relocation, and demolition, as appropriate.

- Foundations and substructure improvements for building over transit facilities.

- Pedestrian connections and access links between transit services and related development.

- Other facilities and infrastructure investments needed to induce significant private investment and to improve access between new or existing development and transit facilities.

- **Special Cost Elements.**

- Utility work. The eligibility of costs of utility work associated with private investment will be considered on a case-by-case basis. FTA will pay for costs of utility work that are attributable to not-FTA project purposes only when--

  - The utility services a joint private and transit use; or
  - The utility lines will be located under a co-located street or sidewalk or within other common elements so that it would benefit the project to provide adequate capacity at the outset of the project.

- Parking elements. FTA participation in financing parking elements of joint development projects will be considered on a case-by-case basis.

- **Participation In Proceeds Derived From FTA Investment.**

- Each grantee must negotiate a fair and equitable return of the benefits to be generated as a result of the FTA investment.

- Local transit must benefit from revenues accruing as a result or FTA financial participation in a project.

- Grantees must retain for transit-use any proceeds and profits realized in connection with FTA participation in joint development projects.

- Proceeds and profits may include returns generated from, but not limited to, sale or lease of property, mortgage proceeds, or returns stemming from participation in the distribution of project revenues.

- In accordance with 49 .F.R. 18.25, if property is sold or leased to a third party, or if any payments are made to the grantee or the public agency in consideration for the use of the property, all proceeds must be treated as program income and applied to capital and operating expenses of the transit system. When the scope of a project intends acquisition and subsequent disposition of properties or related income for joint development purposes, this intent must be clearly stated in the grant. In the absence of such definition, the more customary post-grant rules will be applied, potentially interfering with benefits of joint development.

- The grant agreement will address any special requirements for the use of income in a joint development project.

- Agreements which transfer title or control of land or facilities acquired as part of the FTA project must contain provisions which--

  - Extend the requirements, as appropriate, of the FTA grant contract (see paragraph 8)
  - Ensure that the grantee retains continuing control of the transit assets as long as they are needed for mass transit.

- **Other Funds That May Be Used In Joint Development Projects.** Joint development activities eligible for funding under the Capital Program are also eligible under Section 5307 (formerly Section 9), Section 5311 (formerly Section 18) and Section 5210 (formerly Section 16). Flexible funds transferred from the Federal Highway Administration to be administered by FTA may also be used to support joint development projects.

- **Application Of Requirements To Private Sector Projects** In a joint development project, FTA must determine whether and to what degree various Federal rules apply to the privately funded, non-transit portion of the project. the applicability of Federal requirements such as those of the National Environment Policy Act and the Davis-Bacon Act, labor protection arrangements, third-party procurement requirements, and Buy America, will be resolved on a case-by-case basis. FTA will work with the grant applicant to determine whether, and the extent to which, such Federal requirements apply, particularly to any private development, and the most appropriate procedures for satisfying the requirements.

Joint development can be useful adjunct to a turnkey procurement in those instances where the public sponsor has land, air rights, and/or land use zoning considerations to offer the turnkey vendor. This represents added value of a project where the benefits of the transit investment may be captured through commercial opportunities. These opportunities are directly related to the prospects in the local real estate market and the communities attitudes and actions to promote growth.

RISK MANAGEMENT

The risks associated with rail transit projects are significant. The basic economics of these projects are the ability to maintain a return on equity, pay operating costs, and amortize debt with farebox revenues remain weak in most cases. Some form of external support, either through government subsidies, or infusion of other revenue sources is almost always required. Although not as readily quantifiable as economic risk, the legal, political, and administrative factors that will influence the cost of the project and revenue generation are evaluated very carefully by debt rating agencies, financing institutions and investors and are reflected in their interest rate charges, fees, and terms and conditions of any borrowing and rate of return requirements.

FTA creates a threshold level of funding through the FFGA. Any excess exceeding the FFGA becomes the responsibility of the local sponsor. This is the instrument that FTA uses to manage risk.

Financial Risk

Do the farebox revenues paid by rail passengers provide an income stream to amortize debt, pay operating expenses, and provide an adequate rate of return for investors? Several elements will affect the answer including the validity of the revenue stream and conditions that influence the capital and operating cost of the project.

The ridership modeling will take into consideration assumptions about status of the highway and transit network system; socio-demographic inputs such as population growth and distribution of trips for home based work and non-work trips, special generators such as sports facilities, convention centers, and airports; assumptions influencing the choice of travel modes such as the price of gasoline, parking, cost of maintaining an automobile, bus fares and service levels, rail fare levels and service frequency.

The ridership modeling is done on an interactive basis with cost estimates for the project. For example, the first estimate of project cost will require a certain level of daily ridership at a specific fare level to support the financing requirements. The ridership modeling may show that the number of passengers required to generate the minimum level of fare revenue is greater than the carrying capacity of the rail project assumed in the ridership forecast. Additional trains may be necessary to accommodate this increase in passenger load which effects the cost of the system. The financial institutions evaluating the feasibility of the project will carefully study the relationship between the engineering cost assumptions and the carrying capacity of the system assumed in the ridership modeling.

The rail project may include revenues other than fares in its income stream. These may include real estate related revenues and/or other revenues generated by linkages to the project.

Real estate related revenues may come from real estate projects proposed by the franchisee and/or impact fees, assessment fees/bonds, or other special fees that are derived from the

project's added value to real estate within the rail corridor. Both of these sources of revenues have significant risks.

The private contractor may propose to construct, for example, an office building at one of the station sites. The office building, when leased at an assumed level, will generate a lease revenue stream. This stream is needed to cover the loans associated with the real estate project and also provide support for the rail project. Any claim of additional income from real estate that will flow to support the rail project must be carefully evaluated. The sponsoring agency should require that the real estate project contain a cash flow "pro-forma" analysis; a detail of the financing assumptions including lender requirements and interest rates; a design component for evaluation by the government agency responsible for real estate development permits; and other details of the real estate project that allow for a complete urban design, cost financing, and environmental impact and financial feasibility review.

If the rail project financing includes the use of developer impact fees, benefit assessments, or other fees, a careful review of the legal authority to assess these fees is necessary. This authority may rest with the sponsoring agency or another governmental entity. If another governmental agency is involved in the approval of a real estate project, benefit assessment proposal, impact fees or other value capture related activity, the administrative and political risks to the private partner increase. The sponsoring agency has to carefully evaluate whether the private contractor has properly accounted for these risks. A schedule of activities showing the required approvals and the time line for achieving the appropriate approvals is necessary. In this way the sponsoring agency can realistically evaluate the assumptions used by the private contractor to generate income for the project.

For example, suppose the rail project includes the creation of a benefit assessment district. The private contractor would most likely expect the responsible government agency to issue benefit assessment bonds to support construction financing. In its proposal, the private partner would include the timetable for the creation of the district and issuance of bonds and all the intermediary steps in between that are necessary to sell bonds. These include the district boundaries, method of assessment, and any property owner or voter election procedures. In this way, the sponsoring agency can evaluate the consistency between the timetable shown for issuing bonds and the use of these bond proceeds in the overall financing plan of the project. It will also allow the sponsoring agency to review other administrative and political project risks.

Where forecasted revenues are not sufficient to pay for project construction financing and operating costs, some form of local public subsidy must be identified. This is the primary financial risk for projects in the formative stages. It tends to lessen as a project emerges to a Full Funded Grant Agreement (FFGA) and non-Federal sources of funds are identified and largely in place.

Political Risk

Political risk refers to the interaction of the project with its community environment and the effect of this interaction on project cost. This interaction is characterized in the following way:

the promoters of the project, such as the sponsoring agency and the private partner, provide the media with project progress reports beginning at the development stage and continuing through construction. The media, in turn, provides the community with information about the project. They, in turn, react and try to guide it toward their goals, which are often mixed. Some elements of the community may support the project, others may want it stopped, and the majority most likely remain indifferent. The elected officials responsible for the project have to mediate these competing interests. The conduct and outcome of this mediation can have a significant impacts on timing and costs. It is the responsibility of the transit component of the project to get the public involved early on in the process.

Transit capital planning is complex and expensive. The Major Investment Studies (MIS) planning process includes many diverse groups or "stakeholders" to the process:

- "Owners" or government agency representatives who influence and administer public project funding, which may leverage private investment;
- Other local, state and federal agencies who are operationally impacted by the MIS (transportation plan);
- Elected officials, who represent the voting public and who enact laws to enable project development and project funding;
- The general public, including representatives of special interest and community groups which are organized and authorized to represent the economic and cultural diversity of the metropolitan area, and who act on behalf of special segments of the regional tax base;
- The business community, which may partner with government to fund capital transportation projects in order to develop a regional land-use mix which is beneficial to the general public, and consistent with the metropolitan area's long range plan;
- Technical experts or consultants, with knowledge and skills unique to the processes, proprietary technology, and characteristics of the special purpose environment which constitute the transit project; and
- Contractors, who are motivated by the profit incentive.

The most intense mediation takes place at the environmental review stage. At this point the events which occur have the most cost impact on the project. For example, there might be a section of the project that passes by or through a residential community on an elevated structure. During the environmental process, the community demands that the elevated section be changed to a subway, with an obvious significant increase in cost. This is an extreme example, but represents the process by which costs increase as the project evolves.

Other political risks are associated with the turnkey agreement. Because of the economic weakness of rail projects, most turnkey projects will require some degree of support from the sponsoring agency in order to obtain financing. For example, this support may be in the form of

a guarantee of a minimum gross revenue level that is sufficient to pay operating costs, amortize debt, and provide the return to equity required by investors. If the subsidy approach is not used, the private operator will most likely require the ability to set fares at whatever level necessary to maintain the financial viability of the project.

Both of these support approaches have political risks. The elected officials sponsoring the project may not allow the franchisee complete control over fare levels and also operating schedule. They may provide a level of gross revenue support, but perhaps not in the form required by the financing institutions.

Authorization and Appropriation Risk

The FTA receives authorizations through Congressional transportation acts, the current act is the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). The provisions within ISTEA allow fund transfers for transit projects through the Surface Transportation Program (STP). This has benefited transit capital programs, with over $2 billion in additional Federal funds made available through the FTA grant process. These authorizations, in effect, specify the programs and funding levels over the authorization period. An appropriations act which is part of the annual budget process provides the FTA with funding for a given fiscal year. There are no guarantees that authorizations will continue from one act to another. For example, there are no assurances that the financial provisions of ISTEA will be maintained with respect to transit funding when the Act expires on September 30, 1997. At best, one may look at recent history and make an educated guess of how transit will fare in subsequent Transportation Acts. This means that the Federal funds for a project may or may not be carried forward across authorizations. For projects in construction that are using private financing as the bridge loan mechanism, this implies further financial risk must be borne by the local public sector sponsor.

This presumption of risk borne by the local public sector sponsor is based on a contractual arrangement whereby the turnkey contractor bears performance risk where the system has to operate within specified tolerances, and may be responsible for obtaining construction financing. The local sponsor as owner bears the entire risk for taking-down the construction financing.

While the financing plan may place a heavy reliance on Federal participation, all the local sponsor has is a letter of intent from FTA to enter into a series of payments from the Federal government that constitute a Full Funding Grant Agreement (FFGA). This agreement does not, however, control the Congressional Appropriations process which means that the financial capacity of FTA to satisfy full funding agreements is at least theoretically placed in jeopardy during each appropriation cycle. FTA lessens this risk through a contingent commitment to continue grants pending appropriations and/or authorizations.

Instruments for Managing Financial Risk

The various mechanisms for minimizing and assigning financial risk, as shown in Exhibit 7, are available under traditional procurement as well as turnkey. Under turnkey, however, a broader

array of instruments is likely to be used, and with greater depth and refinement. The instruments are to be used in combination with the intention that the resulting financing program provides the cash flow capacity to accommodate an optimum construction schedule.

Exhibit 7. Range of Financial Risk Management Instruments

Abbr	Instrument	Description
FFGA	Full Funding Grant Agreement	Agreement between FTA and owner to provide a total amount of funding under given conditions; FFGA creates a threshold level of Federal funding.
ContC	Contingent Commitment	Agreement by FTA to continue grants under a FFGA pending a new authorization.
ACFA	Advance Construction Financing Authority	Provision which allows project sponsor to recover construction expenditures.
LOC	Letter of Credit	Indication of willingness by lender to allow borrower to receive funds under specific conditions.
BdR	Board Resolution	Public commitment by local legislative body to provide funds or in-kind contributions.
ResF	Reserve Funds	Deposit of funds in a restricted account as evidence of ability to pay.
ConF	Contingency Funds	Set-aside of revenues beyond anticipated requirements to allow for unexpected needs.
DedT	Dedicated Taxes	Earmarked tax instruments to generate revenues as evidence of political funding commitment.
Bond	Bonding	Insurance (performance bond) required of contractor to ensure that resources are available to complete the project if the contractor should fail to perform.

Exhibit 7. Range of Financial Risk Management Instruments (Continued)

Abbr	Instrument	Description
SubD	Subordinated Debt	Financial instrument whose claims for repayment are subordinate to (come after) other financial instruments.
Ins	Insurance	Means for pooling risks of a similar type among many entities.
FPC	Fixed Price Contract	Contractor is obligated to deliver specified product for a predetermined price.
Contr	Contracts Agreement	Legally binding agreements among participating parties that specify actions that will occur under all contingencies.
Index	Cost Indexing	Unit prices or fixed prices are adjusted according to an agreed-upon price index.
Lcaps	Liability Caps	Specify the maximum amount a party can be held responsible for under stated conditions.
PPP	Public-Private Partnerships	Agreements among public agencies and private sector participants to share risks and responsibilities.
PMO	Project Management Oversight	Third-party oversight of project management to ensure proper controls.
Pqual	Prequalification	Scrutiny of potential contractors' capabilities, previous performance, and experience to assess capacity and reliability.
Corg	Corporate Guarantees	Binding commitment from members of joint venture consortium.
Accom	Accommodation	Willingness to make appropriate accommodations within the scope of a contract so as to minimize unnecessary costs
Rept	Schedule and Cost Control Reporting	Requirements to report milestones, measures taken to control costs, results, and other progress information.
Incen	Incentive Clauses	Schedule of rewards and penalties, value engineering incentives, and other performance incentives.

FTA NEW STARTS PLANNING AND PROJECT DEVELOPMENT PROCESS

Background

With the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) legislation in 1991, regulatory changes were implemented which call for a modified capital planning process, different from the one utilized for the MTA Phase II project. This new planning process, known as Major Investment Study (MIS), is currently required for transit infrastructure projects, and is integrated with National Environmental Protection Act (NEPA) documentation requirements for DEIS and FEIS plans. MIS normally is developed in three steps or phases: (i) identify conceptual alternatives for improving mobility, or meeting the expressed regional/corridor need for transit improvement; (ii) narrow the list of alternatives to a workable number of six to eight, which will be the subject of further study; and (iii) select the preferred alternative after stakeholder review of the relevant technical, environmental, and financial information for each alternative. MIS can proceed under either Option I (MIS report leading to identification of preferred mobility plan, then project scoping/DEIS/FEIS), or Option II (scoping/DEIS leading to identification of preferred mobility plan, then FEIS).

Project justification criteria are applied to projects at all stages of development. Candidate projects are ranked based on their current stage of development, readiness to proceed, and ability to obligate Federal funds in the upcoming fiscal year. Agencies with projects in final design or construction and capable of obligating Federal funds are considered for FTA grant award.

FTA requires project applicants to undertake a defined planning and project development process as described in the joint FTA and FHWA planning regulations. One of the objectives of the planning process is to provide a mechanism for FTA to evaluate major transit capital projects competing for Federal discretionary funds. The major capital investment process includes four phases (see new Exhibit 8):

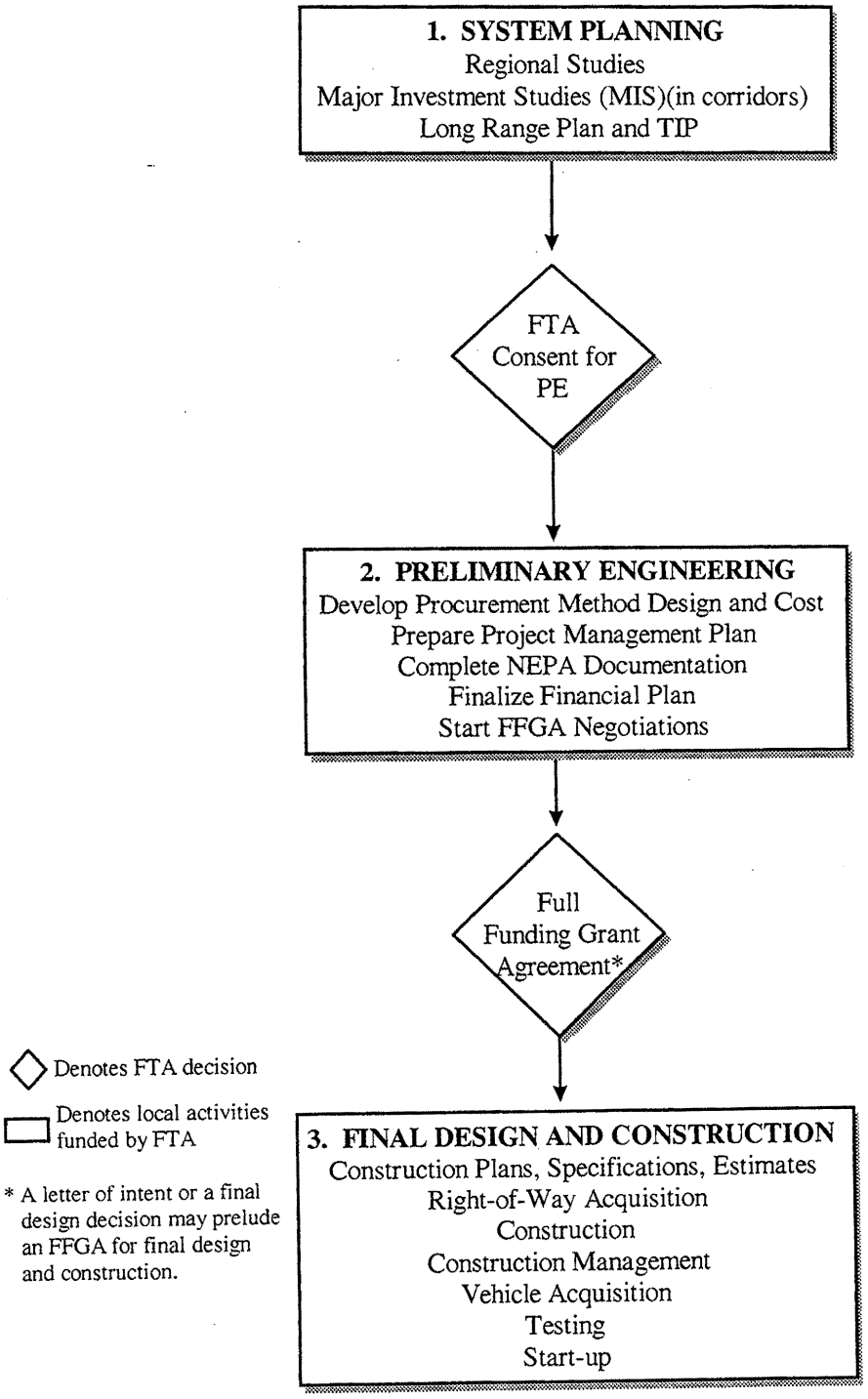
- Planning
- Preliminary Engineering
- Final Design
- Construction (which is shown merged with Final Design)

Planning

System planning may include regional studies, a major investment study (MIS), a transportation improvement plan (TIP), and a long range plan. FTA requires that long range planning efforts are financially constrained.

The planning phase has no major impact on the turnkey approach as part of planning work. Different financing options and mechanisms may be examined.

Exhibit 8. FTA New Start Planning and Project Development Process



Environmental Impact

Before FTA can award capital assistance for a new start project, the social, economic, and environmental impacts of the project, and of reasonable alternatives, must be analyzed. FTA determines that the project qualifies for a categorical exclusion (no environmental assessment necessary); issues a finding of no significant impact (FONSI); or approves the final EIS and issues an environmental record of decision (ROD). New Starts projects are not classified as categorical exclusions.

Preliminary Engineering

After selection of the LPA and FTA consent for the project, the local agency continues with the next phase which is preliminary engineering. During the preliminary engineering phase, the local agency refines the design of the LPA and develops precise estimates of costs and impacts; prepares the final environmental impact statement (FEIS); project management plan; and implements the financial plan.

During preliminary engineering, the local agency may consider a turnkey contract. If turnkey is being considered during preliminary engineering, the turnkey approach would be decided, financing options would be developed, and private sector financing would be solicited. This would generally result in vendor bids which contain extremely large contingencies, thus negating many of the advantages of a turnkey procurement.

Environmental Impacts

The local agency completes the environmental documents required under the National Environmental Policy Act (NEPA). The final EIS must be completed during preliminary engineering after the LPA is identified. The final EIS reviews the comments received during the draft EIS and addresses comments by changing the project location or design; committing to specific mitigation measures or environmental enhancements; or written justification for not changing the project. FTA must complete an environmental record of decision (ROD) before awarding capital assistance. FTA may not issue an ROD until 30 days after the final EIS is filed with the U.S. Environmental Protection Agency (EPA) and EPA publishes a notice in the *Federal Register*.

Project Management Plan

The grant applicant for a major capital investment must develop a project management plan to manage engineering, design, construction, and start-up of a project. The grant applicant must implement a project financing plan, including the commitment of non-Federal funding partners.

The project management plan must address the following:

- Adequate staff
- Budget
- Construction schedule
- Record keeping system
- Change order procedures
- Appropriate organizational structures
- Quality control and quality assurance
- Materials testing policies and procedures
- Internal plan implementation and reporting
- Criteria and procedures for testing the operational system
- Periodic updates of the plan
- Commitment to submit monthly budgets and schedules

FTA requires grant applicants to use value engineering for all major capital projects. FTA cannot approve a grant application for final design funding or a Full Funding Grant Agreement (FFGA) until value engineering is completed.

Final Design

During final design, local agencies produce the plans, specifications, and estimates necessary to construct the project. During this phase, FTA reviews the projects based on certain criteria and determines which projects will be recommended for New Starts funding.

Preliminary engineering produces environmental documentation and inputs for a Full Funding Grants Agreement (FFGA). For purposes of turnkey, final design and construction are a mergered process. The turnkey contractor would have the ability to jointly proceed with final design and construction and might be asked to provide advance construction funding to achieve the optimum construction schedule.

Letter of Intent

If a project has outstanding issues that affect the ratings of an otherwise eligible project, the project is considered for a Letter of Interest (LOI). An LOI provides that FTA may obligate funds from future appropriations. However, an LOI is not an obligation or administrative commitment. FTA may only obligate funds after Congress provides those funds in an appropriations bill. Usually, a LOI is issued to finance major capital projects. If a LOI is issued for a fixed-guideway project, the amount must be sufficient to complete at least a minimum operable segment.

Full Funding Grant Agreement (FFGA)

In order for FTA to provide capital assistance for a project, FTA must enter into a full funding grant agreement (FFGA) with the grantee. The grantee must complete construction of the project within a fixed time schedule. The FFGA establishes the maximum Federal participation in the project and an estimated schedule for Federal drawdowns.

Project Ranking System

In recent years, funds allocated to the New Starts program have been less than that requested by grant applicants. As a result, FTA developed a project ranking system. FTA submits to Congress the required "Report on Funding Levels and Allocation of Funds" (referred to as the Section 3(j) report), which recommends allocations of New Starts funds to projects. Projects considered for funding are ranked based on the following criteria:

- **Readiness:** ability to expend funds soon after appropriated by Congress and obligated by FTA

- **Project justification:**

  - *Cost-effectiveness* - expected cost to attract new riders, not a rider who shifted from another transit mode;

  - *Mobility improvements* - hours of travel time per day expected projected to be saved when the project is constructed;

  - *EPA classifications* - classifications for each city for ozone and carbon monoxide;

  - *Operating efficiencies* - based on the potential of each project to reduce system-wide operating cost per passenger.

- **Local financial commitment:** proposed Federal share of the project; the capital financial commitment, and the stability and reliability of operating assistance

- **Other factors:** local commitments to support land use and transportation policies, and inclusion of the project in a state's air quality implementation plan

Projects that FTA has already issued a LOI or FFGA receive first priority for available funds.

Final design may be an ideal phase to initiate a turnkey contract. It places maximum control in the hands of the vendor and allows the implementation of proprietary technology to meet project specifications.

Construction

A Total Design-Build procurement strategy executed prior to Final Design assigns total responsibility for all system and facilities elements to one contract. There have been two primary reasons for this procurement approach:

- The owner shifts almost total risk for project completion/success to the single contracting entity

- It allows for full competition between different technologies without compromising optimization of facilities design/cost

However, the reasons for using the Total Design-Build approach also presents some disadvantages. By including all of the facilities/civil work in with the system elements, the owner greatly reduces his ability to control the design and construction of the facilities. Also coordination with agencies affected by the system becomes more difficult for the owner because of the loss of control of the facilities designs and construction. Total Design-Build procurement has been used for both small-scale systems and large-scale systems and there are certain lessons learned which stand out as challenges for this procurement approach.

- Rather than the system suppliers taking the lead role for the Design-Build contract, civil contractors assume that role for the large scale projects. This change in leadership/control results in somewhat different approaches to implementation of the system. Civil contractors emphasize construction issues over system operational issues.

- The lead role for the civil contractors is partly mandated by the funding requirements for the large dollar projects. The contractual requirements and bonding requirements are of such magnitude that system suppliers cannot assume the lead role for these contracts.

- The high risks involved in the Total Design-Build procurement results in high pricing contingencies. The limited information developed in preliminary engineering results in some risk of substantial change orders as the system design becomes more film.

The construction phase includes construction management, procurement of vehicles, and testing of equipment before start of new services.

A turnkey contract can integrate construction services and/or assume responsibility for operations.

Funding Issues

In addition to the project planning and development process, the local agency must understand the Federal funding and grant process. Specifically, the local agencies need to understand the differences between authorization, appropriation, and obligation authority to ensure that Federal funds are maximized and used in a timely manner.

Authorization

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) is the substantive legislation governing FTA grant programs. ISTEA authorized a total of $152 billion in Title 23 funding through FY 1997; a total of $5 billion in Title 49 Section 5309 funds for specific projects through FY 1997. In addition, ISTEA establishes the limit on the amount of funds that can be spent each year, which is the budget authority.

Appropriation

Although funds are authorized, Congress must annually appropriate funds. An appropriation allows FTA to incur obligations and make payments for specified purposes.

Obligation Authority

Obligation authority is the total amount of funds available to be spent by an agency in a given fiscal year. Obligation authority includes:

- New budget authority in a fiscal year
- Balance of budget authority from previous years that has not been obligated
- Amounts authorized to be credited to a specific fund during that year including transfers between accounts

Grant Process

Section 5309 New Starts funds are available for three years from the date of appropriation. Funds that are not obligated by FTA to a grantee within the three years are made available for other discretionary projects.

Before FTA awards a Section 5309 New Starts grant to a local agency, the agency must demonstrate that the project is ready to start and that they have obtained the required local financial support for the project.

The FTA process is not well suited with respect to funding turnkey. As projects move through the FTA process the available funds to meet FFGA become stretched over a number of projects.

This acts to limit yearly appropriations to the projects which impacts project financing. Local sponsors are then required to develop a financing program which accelerates cash flow necessary to meet an optimum construction schedule. Absent the flow of Federal grants this generates financing costs. While construction is fast-tracked, financing and the attendant financing costs are extended to match revenue capacity. Since Federal grants are stretched out over time, then revenue capacity is diminished leading to longer debt terms and consequently higher financing costs.

This describes the FTA process for implementing a new start rail project. The major issue with respect to turnkey is the point in the process when the local sponsor proceeds with a turnkey rather than a conventional procurement. The major issue is between the Final Design phase and Construction. Implementing turnkey at Final Design allows the vendor to integrate proprietary technology into the procurement, but lessens owner control and leads to higher contingencies. Since turnkey for transit is in the formative stages it is probably appropriate to structure the procurement for the construction phase.

CASE STUDIES

Case studies are provided for five projects that are participating in the FTA Turnkey Demonstration Program. The five projects are:

- Tren Urbano
- BART to San Francisco International Airport
- Hudson-Bergen Waterfront Light Rail Transit System
- Union Station Gateway Intermodal Transit Center
- Baltimore Central LRT Extension

The focus of these five case studies is on the effect of turnkey on project financing.

Tren Urbano

Project Description

The Tren Urbano rapid rail transit project is the first element of an integrated fixed guideway transit system for the San Juan Puerto Rico region. The system is intended to provide line-haul service within the San Juan region with the city's existing bus and publico services providing the local collection and distribution functions. The proposed system is to be developed in several phases.

The recently selected locally preferred alternative for Phase 1 consists of 17.2 kilometers of double track alignment connecting the Santurce Terminal and Bayamon and serving the municipality of San Juan. Passengers will access this system by bus and publico (existing bus routes will be modified accordingly), private cars, and walking. The proposed project includes 14 stations, a vehicle and trackway maintenance/storage facility, and a 64 vehicle fleet. Approximately half of the alignment - from Bayamon to Rio Piedras - is at-grade and will primarily serve residential, medical, and retail activity centers. The balance of the system - from Rio Piedras to Santurce - features an aerial alignment and will serve the principal business centers of Puerto Rico in Hato Rey and Santurce. A below-grade section is planned through Rio Piedras. The completed system will provide 4 minute headways during peak periods, 8 minute headways during base period service, and 12 minute headways during off-peak periods.

Total capital costs for the Phase 1 Tren Urbano project over the period from 1996 through 2006 are $1.11 billion in year of expenditure dollars. Including the $136.7 million in contingency costs planned for Tren Urbano, total project costs are estimated at $1.25 billion.

Tren Urbano is one of four projects selected by the Federal Transit Administration (FTA) for the Turnkey Demonstration Program under Section 3019 of ISTEA. The Puerto Rico Highway and Transportation Authority (PRHTA) anticipates that construction of Phase 1 will commence in 1996 to become operational in 2002.

Project Financing

The project relies on $312.4 million in FTA Section 5309 New Start funds, which is less than one-third of project capital cost: Local funding sources are generated through the PRHTA. The PRHTA's total full range of planned capital investments over the ten year period covered by the financial plan includes approximately $1.25 billion for Tren Urbano and a further $1.44 billion in un-related highway improvements. The PRHTA receives revenues from a number of sources:

- **Gasoline Taxes** - Puerto Rico imposes a $0.16 per gallon tax on gasoline and authorizes the Authority to pledge the entire $0.16 tax to payment of principal and interest on bonds and other obligations of the Authority or for any other lawful purposes.

- **Gas Oil and Diesel Oil Tax Revenues** - Puerto Rico imposes an $0.08 per gallon tax on gas and diesel oil and authorizes the Authority to pledge $0.04 of this $0.08 to the payment of principal and interest on Bonds and other obligations of the Authority or for any other lawful purpose.

- **Motor Vehicle License Fees** - Puerto Rico imposes annual fees on various classes of motor vehicles, with current fees ranging from $25 to $40 for passenger cars. As with the taxes described above, the Authority is authorized to use such fees for the payment of principal and interest on bonds or notes, or for any other lawful purpose.

- **Tolls on Traffic Facilities** - Tolls on traffic facilities imposed by PRHTA are pledged to the repayment of bonds. Toll revenues have grown as a percentage of PRHTA income, rising from a .045 percent in 1976 to 26.4 percent in 1994. Approximately $67.8 million in toll revenues was generated in fiscal year 1994.

- **Investment Earnings** - Revenues are generated by interest earned on the Debt Service Reserve Fund for PRHTA Revenue bonds and Certificates of Participation (COP).

- **Other Sources** - The CIP identifies $2.5 and $3.0 million from municipalities and private apportionments respectively, in fiscal years 1995 and 1996. Beginning in fiscal year 1997, it is assumed that the PRHTA will secure access to $60 million in surplus Federal Highway Trust Fund monies.

The financing plan features use of various debt instruments.

"Gap" Short Term Financing

The Government Development Bank for Puerto Rico (GDB) frequently provides advances to Commonwealth agencies to support capital programs either in anticipation of permanent financing or to overcome short term "gaps" in cash flow. The Authority anticipates using this credit line to smooth-out its own cash flow needs over the early years of the project.

Certificates of Participation/Subordinate Lien Revenue Bonds

PRHTA has significantly revised its planned use of Certificates of Participation (COPs) as means of financing capital improvements, including Tren Urbano. The current financial plan includes the issuance of $825 million in subordinated debt, including junior lien highway revenue bonds and COPs, backed by funds available after senior lien bond debt service and reserve fund obligations are satisfied. This plan does not identify specific levels of funding to be provided by the junior lien highway revenue bonds or the COPs.

Previously PRHTA had proposed Certificates of Participation (COPs) as a means of financing rolling stock, stations, shops, and other facilities for the Tren Urbano Project. COPs issues are outlined to have a twenty year maturity with service payments covered by Federal Highway apportionments at an 80 percent Federal matching share. The actual issuer of the COPs had not yet been identified as of last year's financial assessment. PRHTA proposed a number of new or existing institutional mechanisms for this purpose including Puerto Rico's Infrastructure Fund, the Public Building Authority, and the Electric Power Authority. It is not clearly stated whether these institutions have the regulatory authority required to issue these COPs for a transit project.

Long Term Debt by PRHTA

Bond proceeds (i.e. senior lien revenue bonds) represent the largest single source of PRHTA project financing. In total this source is expected to provide approximately $1.1 billion or roughly 32 percent of the total costs for all capital investment projects planned by the Authority between 1996 and 2006 (i.e., including Phases 1 of Tren Urbano and highway construction).

Debt service payments for these issues are to be covered by the Authority's general revenue sources including fuel taxes, vehicle registration fees, toll revenues, investments, and federal highway apportionments. Debt service payments projections assume bond issues of 30 years duration at an interest rate of 7.0 percent per annum.

BART to San Francisco International Airport

Project Description

The Bay Area Rapid Transit (BART), in conjunction with the San Mateo County Transit district (SamTrans), plans to build a 7.5-mile, 4-station BART extension (SFO) from Colma Station to Millbrae with an aerial station at the planned International Terminal at San Francisco International Airport (SFIA). The LPA is estimated to cost $1.110 million (escalated dollars). Ridership is projected to be 69,000 trips per day by 2010.

The BART-SFO project is one of the projects participating in the FTA Turnkey Demonstration Program. ISTEA initiated this program to determine if the turnkey (design/build) approach will reduce implementation time and cost. The project has a fast-track construction schedule of five years.

Project Financing

The financial plan assumes that the SFO Extension will receive a total of $750 million in discretionary Section 5309 New Start funds. The California Transportation Commission (CTC) has made a $536 million commitment to BART's Extensions program. This commitment was initially made in October, 1988 in CTC Resolution MT-89-25 and subsequently increased and adopted by the CTC as part of the 1990 and 1992 STIP resolutions.

To date, $340 million of the overall $536 million commitment has been awarded, including $20 million for the SFO extension. The remaining $88 million that is needed for the SFO Extension will be funded from $7 million in approved FY 97 Transit Capital Improvement (TCI) funds, $10 million in dedicated Proposition 116 rail bond funds, $40 million in approved 1996 State Transportation Improvement Program (STIP) funds, and $31 million in future year TCI funds. To strengthen its commitment, the CTC included language in its 1996 STIP Resolution which not only reaffirmed its $536 overall commitment, but also specifically committed this $108 million in CTC-allocated funds to be the BART-SFO Extension.

A Cooperative Agreement was amended by the SamTrans and BART Boards in June 1996. The agreement Amendment reaffirms SamTrans commitment to provide the $99 million direct contribution to the SFO Extension. The Amendment further allows for an accelerated delivery of this $99 million to the extent project cashflow dictates.

The San Francisco Airports Commission and BART have jointly established a budget for the expenditure of Airport funds on SFO Extension engineering, construction, and administration costs for facilities and systems located east of the western edge of the Bayshore Freeway (State Highway 101). This budget is composed of $113 million for SFO Extension design and construction to be performed by the SFIA and $87 million for SFO Extension design and systems procurement and installation to be performed by BART. The SFIA intends to fund its total $200 million contribution to the project through the issuance of General Airport Revenue Bonds, and

has advised its airlines of its intention to commence with the expenditure of such funds in the Fall of 1996. The $113 million SFIA-constructed portion of the Extension would be completed without federal participation, and is, therefore, excluded from the FTA full funding grant agreement (FFGA) budget.

MTC collects $7 million annually in Bay Bridge tolls which are reserved by statute for transit capital improvements in San Francisco, San Mateo, and Santa Clara counties. MTC has already allocated $1 million of these funds to the SFO Extension. In addition, MTC approved on July 24, 1996 Resolution No. 2915 which programs the remaining $9 million in Westbay Bridge Tolls to the project over the next four years.

Several funding sources will be used to address costs in excess of the project's FFGA budget. These funding sources will not be used to increase the current $1.054 billion FFGA budget, but will set aside in a Capital Reserve Account (CAPRA).

The BART-SamTrans Agreement Amendment establishes that BART will have the right to impose a premium surcharge on passengers boarding or alighting at the SFO Airport Station. This supplemental surcharge would generate $3 million to $4 million annually at a rate of $1.50 per fare.

The BART-SamTrans Agreement sets aside half of the proceeds of various ancillary revenue sources to meeting costs in excess of the FFGA budget. These ancillary sources include the advertising and concession revenues generated at the five Colma and SFO Extension Stations. Future ancillary revenues are also possible from joint development activities and parking charges at the Colma and SFO Extension stations.

BART plans to obtain financing for the SFO extension by issuing tax exempt commercial paper which is backed by a Letter of Credit. This Letter of Credit would, in turn, be backed by the federal revenue commitment included in the District's full funding grant agreement with FTA. An optimal financing rate would be obtained if the pledge of the FTA funds was collateralized by a back-up pledge of the District's sales tax and other general fund revenues. BART recently received legislative authorization to make such a financing pledge with Governor Pete Wilson's signing of SB 388 (Kopp).

It is assumed that BART could issue commercial paper at a 3.75 percent annual rate. Issuance costs would increase the gross financing rate to 5.5 percent. If financing were available at 5.5 percent, and the revenue and expenditure assumptions held true, then the total financing costs associated with the SFO Extension would equal $40 million. The additional financing costs associated with higher interest rate assumptions are provided for in the Capital Reserve Account (CAPRA) consisting of; surcharge revenues, premium fares, and ancillary revenues.

Hudson-Bergen Waterfront Light Rail Transit System

Project Description

The New Jersey Transit Corporation (NJ Transit) is proposing a light rail transit line along the Hudson River waterfront in Hudson County. The full project is a 20.5 mile, 33-station at-grade LRT line from the Vince Lombardi Park-and-Ride lot in Bergen County to Bayonne. The project passes through Port Imperial in Weehauken, Hoboken and Jersey City. The outer ends would provide 8,800 park-and-ride spaces. The core of the system would serve the high density commercial and residential centers in Jersey City and Hoboken and connect to ferries, PATH, and NJ Transit commuter rail lines. A 10-mile "initial operating segment" would connect the Hoboken Terminal to 34th Street Bayonne and Westside Avenue in Jersey City.
The 20.5-mile system is expected to cost $1.3 billion (escalated dollars) and to carry 81,448 riders per day. The initial operating segment is expected to cost $623.9 million and to carry 31,275 riders per day.

NJ Transit is using a turnkey procurement to implement the project. A solicitation for proposals to design/build/operate/maintain was issued in November 1995. Possible opportunities for equity participation by the successful proposer will be identified during this process.

The Hudon-Bergen Line will be designed, built, operated and maintained by a private contractor through a DBOM (design, build, operate and maintain) contract--and will be the first successfully implemented DBOM project in the history of U.S. Transit. (Both Honolulu and Houston proposed DBOM procurements for transit systems, but the projects were unable to raise sufficient locally-generated revenues.)

Under the contract, ownership of the system will remain with NJ Transit. NJ Transit will pay the contractor first to design and build the system, with payments contingent on the achievement of pre-established milestones during the anticipated three-year construction period. Performance bonds and other measures will be used to protect NJ Transit in the event that the contractor is unable to fulfill its obligation.

During the fifteen year operation and maintenance phase, NJ Transit will receive revenues generated by the system and compensate the contractor based on its costs with incentives for cost reductions and service improvement. In addition, there is provision for future releases of funds for additional vehicles, systems and other construction work to be procured from the contractor as the system is extended and service expands. Inflationary escalation is provided for in the contract to ensure that the contractor is paid in an equitable fashion.

Project Financing

The Hudson-Bergen Light Rail Transit System (HBLRT) and the Newark City Subway projects are funded from the NJ Transit capital program. The capital program is approved on a five-year basis that is updated annually and is comprised of allocations from federal, state and

miscellaneous sources. The current five-year plan has a total of approximately $620 million in its FY 1996 budget. NJ Transit establishes program priorities through its capital planning process.

In the current five-year NJ Transit capital program, $400 million has been allocated to the HBLRT project between FY 1996 and 2000 (subject to the availability of funds), with $80 million available per year. It is anticipated that an additional $80 million will be allocated to the HBLRT for FY 2001 during the next five-year planning process.

Primary sources of funding for the HBLRT project include the following:

- New Jersey State Transportation Trust Fund funds--these funds were reauthorized on May 30, 1995 and, in a related bill, the state legislature has gone on record as supporting the "Circle of Mobility" projects which include a "Newark - Newark International Airport - Elizabeth Transit Link" and a "rail connection between Penn Station Newark and Broad Street Station";

- FTA Formula Funds (49 USC Section 5307 funds, formerly Section 9 funds); and

- FTA new start funding (49 USC Section 5309 funds, formerly Section 3 funds)--These funds were specifically authorized in ISTEA to initiate the New Jersey Urban Core projects of which HBLRT is a part.

- Other sources of funding include federal highway funds which may be used for transit-related capital projects and funding that is provided, from time to time by the Port Authority of New York and New Jersey and other state, interstate and federal agencies.

During the 1996 fiscal year, NJ Transit anticipates that it will sign a Full Funding Grant Agreement with the FTA for the HBLRT project. Due to credits provided for historical expenditures made on its transportation system, NJ Transit is permitted under the ISTEA to receive Section 5309 grants without the normally-required local match. As a result, the Grant Agreement could cover up to 100% of the cost of the initial operating system.

Contractors are encouraged to propose financing structures within this projected stream of cashflows that include leases, loans and other techniques. NJ Transit has also encouraged contractors to include proposals to acquire and lease rolling stock for the HBLRT project and to develop supplemental revenue sources including advertising and concessions. Finally, NJ Transit has committed to make reasonable efforts to match specific cashflows required by DBOM contracts through short term borrowings to advance funds in anticipation of future grant funding and from seeking special appropriations from the New Jersey State Legislature.

Union Station Gateway Intermodal Transit Center

Project Description

The Union Station Gateway Intermodal Transit Center is intended to be the central transportation hub for all of Los Angeles. It will provide a major link between major transit systems including the following:

- Regional and Local Bus Lines
- Commuter Rail Lines
- Heavy and Light Rail Lines
- Electric Trolley Lines
- Van Pools, Taxi and Shuttle Service
- Regional and Local Freeway Systems

The Transit Center, which will consist of three facilities, will serve an estimated 115,000 multimodal transit users daily.

- The Bus Plaza will link the public transit and parking elements to create a highly visible public space. It is projected this intermodal transit facility will increase daily bus ridership by as much as 15,000 riders per day.
- The Portal Pavilion, located adjacent to the Bus Plaza, will serve 30,000 awaiting and disembarking passengers transferring between various transit modes each day.
- A Park-and-Ride Facility will provide 2,500 spaces adjacent to six heavily traveled freeways, encouraging automobile commuters to complete their commute using alternative modes of transit. This facility is expected to serve an estimated 8,000 carpooling commuters per day.

The proposed Union Station Gateway Intermodal Transit Center will be located behind the old Union Station and strategically located near the business and government core (Civic Center North), and three of the oldest ethnic and cultural communities in the City: Little Tokyo, Chinatown, and Olvera Street/El Pueblo de Los Angeles.

Joint development is an important part of the plan for the development of the Transit Center. The District will develop this project in conjunction with Catellus Development, a private sector real estate developer. In addition to the Transit Center improvements, plans call for the Phase I development of up to a 650,000-square foot office building (28 stories with 800 parking spaces) which will serve as the future headquarters for the District. Additional phases will include a minimum of 600,000 gross square feet office towers.

The current plan for the surrounding area includes up to five phases of commercial development, hotels, restaurants, retail space, and an Amtrak concourse. The higher density, from the joint development perspective, will encourage transit ridership among the office tenants and retail patrons. The result will be higher use of mass transit, assistance in meeting air quality goals, and reduced traffic congestion.

Project Financing

The Transit Center is included in the Los Angeles County Transportation Commission's 30-Year Integrated Transportation Plan and the adopted Regional Transportation Improvement Program. The program contemplates a five-year funding scenario for the Transit Center improvements, based on an overall project cost of $149,543,000.

The five-year funding pattern is feasible, but does not provide a match of expenditure level and cash flow. In order to complete construction in a timely and cost-effective manner, the five-year funding scenario would require the issuance of debt to pay for costs incurred near the end of the construction period. The use of debt would require additional project costs in the form of issuance costs and interest carried for the period of time from the date of issue through the receipt of the final grant payment. Financing will be accomplished using a Tax Exempt Commercial Paper (TECP) program. The summary of funding sources is provided below.

Federal funds are derived from the FTA Section 5309, Bus Discretionary program, $57.7 million, Surface Transportation Program (STP) flexible funds $8.5 million, STP Enhancement funds, $27 million and Congestion Mitigation and Air Quality (CMAQ) funds, $6 million. This project provides a primary example of creating a mix of Federal funds to extend the FFGA under the FTA Section 5309 programs.

Baltimore Central LRT Extensions

Project Description

The Mass Transit Administration (MTA) of Maryland is building three extensions of the central light rail transit (LRT) system in metropolitan Baltimore with FTA support. The extensions are: a 2-mile, 2-station branch off the LRT main line in Lithicum directly into the Baltimore-Washington International (BWI) Airport terminal; a 5-mile, 5-station extension from Timonium to Hunt Valley; and a quarter-mile, one-station spur off the main line into Pennsylvania Station where Amtrak northeast corridor trains and MARC commuter trains stop. The project is estimated to cost about $106.3 million (escalated dollars).

The project is being implemented using the design-build method, and is one of the projects participating in the FTA Turnkey Demonstration Program. All three extensions are under construction at varying stages. Construction is expected to be complete by February 1997 on all three extensions. Revenue operation for all three extensions is scheduled for May 1997. The

sources of funds for the projects are $84.90 million in FTA Section 5309 New Start grants and $21.44 million in local funding.

Project Financing

Financing for Maryland Department of Transportation (MDOT) is provided by the Transportation Trust Fund (TTF). The Trust Fund is credited with and combines the taxes, fees, charges, bond proceeds, federal aid and operating receipts of the department, excluding toll revenues collected by the Maryland Transportation Authority (MdTA), into a single fund. All expenditures are made from the trust fund, including revenue shared with local jurisdictions. The trust fund supports the department's debt service, maintenance, operations, administrative and capital expenses. TTF resources are provided to the MTA for both capital needs and operating requirements.

The following state taxes are credited to the TTF and constitute the major sources of revenue to MDOT.

- Motor vehicle fuel tax at 23.5 cents per gallon.
- Motor vehicle titling tax, imposed at the rate of 5 percent on the fair market value of motor vehicles for which certificates of title are issued.
- Portions of the state's 7 percent corporate income tax.
- Motor vehicle license and registration fees and other fees.

The financial capacity provided by the TTF enables pay-as-you-go financing for the local share for this project. For a larger dollar valued project the TTF provides debt capacity which could be used to accommodate the cash flow requirements of a turnkey. This is a model of state financial participation in transit funding (similar to New Jersey and Michigan) which presents both direct and debt financing opportunities of a magnitude necessary to meet the fast-track construction schedules, which are one of the principal benefits of turnkey procurement.

The following three case studies are provided to illustrate different approaches to structuring a turnkey project. These case studies relate to toll roads, multimodal facilities and rail projects and illustrate the potential for and requirements imposed for financing turnkey. The materials follow the organizing themes developed in previous chapters. Each project for the case studies is briefly described, which is then followed by a discussion focused on the organizing themes.

- Institutional Arrangements
- Financing
- Risk Management

This section on case studies is followed by a Conclusions section, which provides summary comments regarding United States and international experience with turnkey projects.

San Joaquin Hills Transportation Corridor

The San Joaquin Hills toll road is the first public toll road in California. It initially is planned as a 14.5 mile, six-lane, limited access highway in southwestern Orange County. The road will have 10 interchanges and seventy eight (78) bridges and will provide a direct route from Newport Beach to San Juan Capistrano. The northern end will connect directly with the existing Corono del Mar Freeway (State Route 73) near John Wayne Airport and the southern end will meet I-5 near Avery Parkway; the toll road runs almost parallel to the Pacific Coast. The location was chosen, in part, to provide crucial relief to heavily trafficked I-405, I-5, and the Pacific Coast Highway, as well as other major arterial roads in the county. However, this corridor also has an intrinsic commutation demand in the increasing residential development surrounding the southern terminus and the highly developed Irvine central business district near the northern terminus. The toll road's design includes an 88 foot median to accommodate the proposed future building of two HOV lanes, as well as possible transit options. While the new road construction will cover 14.5 miles, the project also includes an additional 4.2 miles of widening on I-5 and 0.7 miles of improvements on State Route 73. The entire toll road is scheduled to open to traffic in March 1997 with a segment between Laguna Canyon Road and Moulton Parkway scheduled to open about a year earlier, in April 1996. The San Joaquin Hills toll road is the initial leg of a 67-mile toll road system being built in Orange County by the San Joaquin Hills Transportation Corridor Agency (TCA) and its sister agency, the Foothill/Eastern Corridor Transportation Agency.

Institutional Arrangements

The San Joaquin Hills Transportation Corridor Agency (TCA) was created in 1986 pursuant to a joint exercise of powers agreement among Orange County and 10 cities within the county to finance the project. The TCA board consists of one elected member from each participating city and two elected members from the county. The 10 constituent member cities are: Costa Mesa, Dana Point, Irvine, Laguna Hills, Laguna Nigel, Mission Viejo, Newport Beach, San Clemente, San Juan Capistrano, and Santa Ana. The TCA has the power of eminent domain and the ability to impose development impact fees, as well as the sole authority to set and raise toll rates.

The TCA has assembled a strong project construction team, with extensive experience in all pertinent areas. The primary contractor, California Corridor Constructors (CCC), is a joint venture between Kiewit Pacific Co. and Granite Construction Co. Kiewit Pacific Co. is a subsidiary of Kiewit Construction Group, a contracting arm of Peter Kiewit Sons' Inc., established in 1884 and one of the largest highway contractors in the United States (U.S.). Granit Construction is the largest highway contractor in California and the fourth largest in the U.S.; both Granite and Kiewit Pacific have done considerable work with CalTrans. All obligations of CCC, are joint and several obligations of the two companies. CCC hired Parsons Deleuw, Inc., an international design/build contractor, as lead design engineer. TCA hired a design manager to

oversee the design process, as well as a construction engineering manager to oversee the construction process. The Corridor Design Management Group is a joint venture consisting of four major companies involved in various aspects of highway design and construction; Howard Needles Tammen & Bergendoff; Parsons Brinckerhoff Quade and Douglas, Inc.; and Church Engineering, Inc. Likewise, the construction engineering manager hired, Sverdrup/Bechtel, (composed of Sverdrup Corp. and Bechtel Infrastructure Corp.), which are national and international industry leaders, respectively.

The project has received strong support from all levels of government. In the 1987 Surface Transportation Act, the U.S. Congress designated this toll road as one of a limited number of pilot projects eligible for up to 35% federal funding. Congress acted on that designation in August 1992 by making a $120 million federal line-of-credit (LOC) available to the TCA to pay debt service, if necessary, during the first five years of the toll road's operations. Only 20% of the LOC, or $24 million, is available in any one fiscal year; any draws must be repaid in no more than 30 years at the rate on the 30-year Treasury bond at the time to draw was made. The TCA has applied to the IRS for a private letter ruling on whether its use of this federal LOC could cause taxability of the bonds. The agency has covenanted never to use the line if the IRS rules that taxability of the bonds could result from such use. On the state level, support for the project is evidenced by the California Transportation Commission's commitment of a $40 million grant and the State and Local Transportation Partnership Program's commitment of a $71 million grant for construction reimbursement. On the local level, the Orange County Transportation Authority has extended loans to the TCA to maintain project momentum. In addition, various public hearings, polls, and advisory ballots have indicated local support for the project ranging from 50% to 80%, depending on the part of the county.

Financing

These sources and uses of funds for the project are shown below.

Sources and Uses of Funds* ($ Mil)

Sources	
Senior Lien Bonds	1019.9
Junior Lien Bonds	101.1
Advanced Funded Development Impact Fees	31.0
Federal and State Funding	110.7
Interest Earnings (1)	110.1
Total Sources	**1372.8**
Uses	
Design/Build Contract Price	702.9
Agency Costs	128.5
Project Contingency	100.0
Loan Repayment (2)	18.4
Senior Lien Capitalized Interest (3)	269.1
Senior Lien Debt Service Reserve Fund	75.0
Junior Lien Debt Service Reserve Fund	10.0
Financing Costs	28.0
Original Issue Discount	41.0
Total Uses	**1372.8**

*Subject to change. (1) Assumes an investment rate of 4.0% on moneys in the construction fund, 6.0% or moneys in the reserve funds, and 4.9% on moneys in the capitalized interest account. (2) Includes repayment of loans to Orange County Transportation Authority and Morgan Guaranty Trust Co. of New York. (3) Represents capitalized interest on the senior lien bonds through March 1999, which is two years beyond the scheduled completion date of the toll road. Note: Numbers may not add due to rounding.

The favorable rating provided by Fitch Investors Service, Inc. of investor grade BBB for $1.02 billion in Senior Lien Revenue Bond was based on the perceived strong demand for a thoroughfare to service the San Joaquin Hills corridor. The new toll road will relieve current extreme vehicular congestion in southern Orange County, link the residential areas at the proposed toll road's southern end to the Irvine business district at its northern end, and accommodate future development. Projected levels of traffic for the toll road constitute a conservative 11% market share of southern Orange County's vehicular traffic demand, increasing slightly in later years. The project's economic feasibility is further supported by the forecasted traffic levels and resultant projected net toll revenues' demonstrated ability to withstand rigorous stress tests and still adequately cover debt service. In addition, financial support has been extended to the project from federal, state, and county governments, demonstrating their commitment to the project's success.

Counterbalancing these positive credit factors are several risks, including ongoing environmental litigation and the potential for additional litigation or changes in law, most notably concerning air

quality and environmental issues. These concerns could hinder adherence to the construction schedule and produce lower-than-expected traffic levels. Furthermore, the initial toll rate will be among the top currently charged in the United States, although Orange County's high wealth indicators should help to ameliorate this concern. Depending on a ruling by the Internal Revenue Service (IRS) concerning the taxability of the project's federal letter of credit (LOC) assistance, this extra level of protection may not be available to augment pledged revenues for payment of these tax-exempt bonds. The first five years of the project's operation, when the federal LOC would be available, show projected debt service coverage at its lowest levels, as is typical of most "start-up" toll roads. Finally, possible construction of competing roads and/or other transportation modes also exists. The financial strengths and risks of the project are summarized below.

- **Strengths**

  - Highly experienced Transportation Corridor Agency (TCA) management and exceptionally strong project team
  - Project's ability to divert traffic from other highly congested roads in the region; opening day traffic forecast at a conservative 11% of total corridor traffic
  - Strong service area wealth indicators
  - Construction risks adequately addressed; all environmental permits received
  - Strong support from all levels of government in the form of financial commitment

- **Risks**

  - Ongoing environmental litigation that could delay the project opening
  - Regulations governing air pollution control requirements may become more stringent, resulting in lower-than-expected toll revenues
  - Toll rates will be among the highest in the U.S.
  - Potential construction of competing roads and/or other transportation modes

Risk Management

CCC provided the project's design/build contract, which is a fixed price of $787 million and a fixed-term for substantial project completion of four years from the bond issuance date. Therefore, the contractor assumes all risks associated with cost overruns and timely completion. The majority of contract costs are associated with earthwork, bridges, and retaining walls (almost $400 million) due to the corridor's location through a ridge of foothills. The TCA has modified the original design plan by rescheduling some of the work to be completed after the project's opening to enhance the project's economic viability. To reduce the initial amount of bonding necessary to finance the project CCC also agreed to accept a portion of its payment ($37,891,000) in subordinated notes repayable from the first surplus revenues available from the project after the payment of scheduled debt service. CCC subsequently loaned the TCA

$6,650,000 to continue with certain preconstruction activities and will be repaid this amount with bond proceeds at closing. CCC's out-of-pocket advance and its acceptance of unscheduled deferred payment display its confidence in the feasibility of the project.

Additional significant components of the design/build contract binding CCC include strong liquidated damages provisions and, conversely, early completion incentives, as well as one year warranty on all contract work and monthly contract compensation payments dependent on achieving targets specifically outlined in the critical path schedule. Certain force measure event risks that could cause construction delays are not assumed by the contractor in the design/build contract; however, those delay risks specifically excepted throughout the construction period (and thus risks assumed by the TCA) are covered by a $100 million project contingency fund, as well as two years of capitalized interest beyond the scheduled completion date. Thus, the only "event risk" during construction not covered by either the design/build contract or the financing's capitalized interest and project contingency fund is the risk of litigation, especially litigation concerning the environmental permitting of the project. The contract further requires CCC to carry various types and levels of insurance to cover many of its assumed risks under the contract.

The basic structure of the San Joaquin Hills contracts and a subsequent contract for the Eastern Transportation Corridor are similar in many respects. However, lessons learned from the San Joaquin project proved to be valuable in the overall design-build bidding process for the Eastern Corridor and improved documents in a variety of aspects. These included:

Obtaining all of the essential major environmental permits for the project prior to the bid date. Completing the acquisition of more than 90% of the right-of-way prior to financing. Revising the standards for financial qualifications for bidders, to focus on issues which were important in obtaining financing for the SJHTC:

- Determining the low bid based on a present-value analysis of projected progress payments, which is included in the contract as a cap on payments

- Requiring the contractor to provide "key personnel" early on to manage environmental mitigation, right-of-way, and utility relocation activities

- Requiring the contractor to deposit a copy of all documents used in preparation of its bid for the project into escrow, concurrent with the bid

- Including a requirement in the contract that the contractor commit to accept project revenue certificates

Risk management was enhanced by the introduction of innovative Agency-Controlled-Insurance Program (ACIP). The ACIP provides the contractor with general liability insurance, professional liability insurance, and builder's risk insurance during construction subject to certain limitations. This program resulted in an estimated reduction of the overall cost of insurance by $6.3 million. The program includes financial incentives to develop and implement strong safety standards and promote partnering on the project.

Hong Kong Eastern Harbour Crossing Project

The Hong Kong government has formulated and is implementing a territory-wide plan designed to reduce congestion and provide efficient transport links to all parts of the territory. The construction of the Eastern Harbor Crossing was an essential part of that plan.

The crossing, which cost about HK $3.4 billion (US $435 million) is the largest single transportation project undertaken by the private sector in Hong Kong. It is a complex tunneling project comprising 8.6 km of roads and a 5-km extension to the Mass Transit Railway. The new tunnel has significantly eased cross-harbor road and rail congestion and is making a major contribution to the transportation infrastructure of the territory.

The project will provide a road and rail crossing of Victoria Harbor between Quarry Bay on Hong Kong Island and Cha Kwo Ling in Kowloon Peninsula, and is some 2,300 meters between portals. The crossing is achieved by means of an immersed tube 1,860 meters in length across the harbor, with cut-and-cover tunnels forming the approaches for the road and rail tunnels on the Kowloon side but bored tunnels on Hong Kong Island.

The immersed tube consists of 15 units, each constructed of reinforced concrete and having a deadweight varying between 44 and 46 thousand tons. The units house five separate conduits, two of which accommodate the railway, two that accommodate the road and the fifth forming a service and ventilation duct. Ventilation buildings are situated at each end of the immersed tube, and provide not only a separate ventilation system for the road and rail tunnels but also house the auxiliary electrical and mechanical service equipment.

Institutional Arrangements

Since the late 1970s, the Hong Kong government had been actively considering a second road crossing of Victoria Harbor to overcome ever increasing traffic congestion. However, the government had yet to crystallize its thoughts on this matter when in June, 1984 it received a proposal from Kumagai Gumi, Marubeni Corp. and the Mass Transit Railway Corporation for a combined road and rail crossing. After discussion, the government called for open tenders in October, 1984, and on April 1, 1985 nine international bids were submitted. In June of that year a shortlist of three was selected. Kumagai Gumi expanded its consortium to include the China International Trust and Investment Corp. of the People's Republic of China, Paul Y Construction Company Ltd. of Hong Kong and Liley Construction Ltd. of Britain. Together they formed the New Hong Kong Tunnel Consortium.

After extensive negotiations, the government announced in December, 1985 that the consortium led by Kumagai Gumi was the successful bidder. The Eastern Harbor Crossing Ordinance, providing the legislation granting the franchise, was passed and construction was started on the project in August, 1986. Construction was completed in September 1989, four months ahead of schedule.

The organization of the project includes separate road and rail companies and franchises. The New Hong Kong Tunnel Company, Ltd. (NHKTC), the road tunnel company is owned by the Government of Hong Kong, China International Trust and Investment Corp. of the People's Republics of China, Kumagai Gumi Co. Ltd., Marubeni Corp., Liley Construction Co., Ltd. of the United Kingdom, and Paul Y Construction Co. of Hong Kong.

The Eastern Harbor Crossing Company Ltd. (EHCC), the rail finance company, is owned by Kumagai Gumi and China International Trust and Investment Corp. The main contractor is Kumagai Gumi, which has entered into a fixed-price, lump-sum turnkey contract with NHKTC, which has contracted with EHCC for design, construction and management.

Financing

A HK $4.4 billion (US $565 million) multi-source debt and equity financing package was arranged for the Eastern Harbor Crossing Project. It is comprised of a HK $3.3 billion (US $429 million) debt financing package and HK $1.1 billion (US $135 million) in equity. HK $2.8 billion (US $359 million) was for the NHKTC, owner of the road tunnel. HK $1.6 billion (US $205 million) was for the EHCC, owner of the rail tunnel.

The financing structure was designed to accommodate the objectives and constraints of the project sponsors and future shareholders, financial institutions, and the Hong Kong government. It effectively integrates bank credit facilities, provided by a syndicate of local and international banks, and installment sales credit facilities, provided by Japanese and Chinese leasing companies, within a common security package.

Terms for the project debt financing include repayment provisions extending to the year 2007 with no financial guarantees, "soft loans," or special aid from any government. The debt will be repaid solely from road tolls and rail operating payments to be made by the Mass Transit Railway Corp.

Security for the debt and equity financing rests largely on the 30-year road and 22-year rail franchises granted in August, 1986 to the new Hong Kong Tunnel Consortium.

Separate and independent debt and equity financing for the road and rail tunnels were structured to satisfy the government's detailed requirements as set forth during the franchise competition while at the same time creating a sound basis for both creditors and investors to put their money at risk. This separation enables NHKTC to issue equity capital in the Hong Kong market at an appropriate time and will permit the general public to share in the anticipated financial success of the project in years to come. The terms and conditions of the debt financing permit the shareholders to receive dividend payments subject to the satisfaction of certain financial tests.

The financing package also allows the two project companies access the most cost-effective finance sources available, including fixed and floating rate bank loans and negotiable instruments, tax-based leases and export credit.

Risk Management

The financial risk of the project was managed through the following:

- Only limited and non-recourse credit is used
- Debt financing is entirely in local currency
- Equity financing is in currencies which are considered relatively strong
- There are major innovations in the project financing structures and in the financing vehicles and terms that were carefully tailored to the particular project
- The environment provides project creditors with confidence regarding the commercial and political risks for unusually long periods
- Governments have accepted some project risks and have provided limited resources

Arlandabanan (Arlanda Rail Link)

The project consists of the development of a 25-mile rail link between Stockholm Central Railway station and Arlanda Airport. It includes construction of a new 20 km twin-track railway, together with 3 underground stations at Arlanda Airport and modifications to Stockholm Central station. It also includes procurement of seven new train sets for airport shuttle service.

Institutional Arrangements

The project will be developed by a consortium of GEC Alsthom (France, U.K.), 29%; NCC (Sweden), 22%; Saab (Sweden); 22%; Vattenfall (Finland), 20%; and Mowlem (U.K.), 7%.

- Contractors: Joint venture between consortium members; single turnkey contract
- Equipment Suppliers: ABB Signals (Sweden), signaling system, and GEC Alsthom (France), train sets, electrical, signaling and telecommunications systems
- Bidding Process: Based on EU competitive tendering procedures
- Bidding Schedule: Prequalification invitation was in July 1993; tender invitation was issued in November 1993; preferred bidder was selected August 1994
- Status: Financing closed July 1995. Syndication closed. Under construction
- Target Completion Date: Arlandabanan is expected to be operational in late-1999.

Financing

The project developers will receive a build-operate-transfer (BOT); 45-year concession. Financing is without recourse to the sponsors or the Swedish government, at a project cost of Skr 4.5 billion ($677.25 million). The financing consists of a mix of equity and debt. The equity contribution of Skr 600 million from the sponsoring consortium, split according to shareholding, and an Skr 850 million grant from the Swedish government.

The debt financing illustrates the complexity of multi-national arrangements. Debt consist of an Skr 800 million lease arrangement by Nordbanken Finans for the rolling stock; a Skr 1 billion subordinated loan from the Swedish government; and a term loan of Skr 1.33 billion arranged by UBS (financial agency), Bank of Tokyo (technical agent), and Bayerische Landesbank, each contributing one third of the total. This consists of: a Skr 1 billion offshore debt facility and a Skr 330 million guarantee in support of the Nordic Investment Bank (NIB) (Finland) facility which falls away progressively after construction. Tenor is 15 years for commercial banks, four years for construction and 11 years during operation, and 25 years for the NIB facility. Margin is at 200 basis points (bp) pre-completion and can fall to 150 bp after completion if certain tests are met. Repayment is semi-annual after a year's grace period. Participants in the syndication are Bank of America (U.S.), Banque Nationale de Paris (France), Commerzbank (Germany), Enskilda Banken (Sweden), IBJ (Japan), Swedbank (Sweden) and Royal Bank of Scotland (U.K.), with Skr 100 million each, and Dresdner (Germany), with Skr 70 million.

Financial Risk Mitigation

The project purchase agreement sets out obligations of involved parties. The Swedish government constituted the Arlanda Rights Co. (Sweden) to negotiate all contracts and to act on its behalf.

The primary risk mitigation factor allows the concessionaire freedom to set fares as it will operate in a competitive market. It will also charge other rail operators for use of the airport rail link. Expected fare will be Skr 80 for a single, one-way fare on the airport shuttle.

This equates to a fare of about $12 for a 25 mile one-way trip. This illustrates the potential for rail to meet private market tests based solely on fare revenues. The United States has systems that could adopt aggressive fare pricing for airport service, such as Boston, Washington, Philadelphia, Baltimore, Atlanta, Chicago, and San Francisco (in the near future), but have instead chosen to keep airport fares on par with the system fare structure.

CONCLUSIONS

Several observations can be made regarding United States and international experience with turnkey/BOT projects. These observations are summarized below.

- In the United States, the majority of transit turnkey projects have been funded through Federal programs (FTA grants). However, turnkey procurement has not been used widely because of the limitations on federal funding programs for private projects and the less expensive financing offered by tax-exempt bonds, which encourages the public sector to maintain reliance on conventional procurement processes. While many of these limitations are being relaxed, the domestic financial markets are still unsure about the opportunities and risks posed by private infrastructure investment. However, with the recent toll road experiences, lending institutions can become more accustomed to assessing the risk associated with transportation projects.

- Toll roads provide more examples for turnkey financing because they generate a steady stream of revenues from user fees. Transit projects can capture revenues from real estate development in and around transit stations. However, these opportunities are more speculative and very dependent upon the strength of the local economy. Real estate development revenues may not provide adequate security for debt financing, and may need to be combined with other revenue sources. Other potential revenue sources include operating agreements, dedicated local tax revenues, lease payments, and/or fare revenues.

- Turnkey projects (or a variation) in the United States, tend to be projects that could not be built under conventional methods, mainly because of limited public resources or time constraints. They are initially proposed and supported by public agencies, who then seek private involvement. However in other countries, private consortia or development banks often identify project opportunities, and then propose them to the host governments, contingent upon private funding sources from the various international financial lending institutions.

- In several international cases, such as the Dartford Crossing project in England and the Sydney Harbour Tunnel project in Australia, the government made existing facilities available to the project company so that tolls could be used to help finance the project. This strategy has not yet been used in the United States for a multi-modal turnkey project.

- Financing for full turnkey projects is typically privately arranged through large international banking corporations and multi-lateral financial institutions. International development banks, mainly the International Finance Corporation (IFC, a private arm of the World Bank) have been involved in providing financial support for turnkey projects. The World Bank may conduct feasibility studies, sector studies, or provide advice for host governments, as well as to provide loans to finance or support BOT projects. The International Finance Corporation may make equity investments in the BOT projects, provide direct loans, or underwrite and

syndicate commercial loans for projects. However, in the United States transit experience, there still remains significant public sector financial participation.

- The stability of economic and political elements in the project location are important factor to the success of a turnkey project. This is particularly significant in assessing the risk associated with a project and allocating the risk accordingly in the turnkey contract. This is of greater concern in developing nations than in the United States; where financial markets and political factors are (relatively) more stable and mature.

- In both the United States and foreign markets, the up-front work for turnkey projects (feasibility studies, complicated legal and financial negotiations) may be so expensive that it prohibits serious consideration by most firms. Major international construction companies have more ability to pay for up-front work while they are in the process of securing project approvals and/or financing. In addition, smaller companies are often unable to secure the capital or equity needed to initiate a large transportation project.

- Inclusion of government as an equity partner in a turnkey project is not unusual. This strategy could provide substantial operating support, credit, or equity, in addition to political support and legitimacy. This strategy has been employed by projects in the United States and abroad.

A comparison of turnkey projects in the United States and abroad demonstrates that the turnkey/BOT approach has been much more utilized in other countries. This is the result of several factors:

- Availability of inexpensive tax-exempt debt financing in the United States for public infrastructure projects;

- Extremely limited public resources in other nations, especially less-developed nations;

- Extensive public requirements for competitive bidding procedures and contractual arrangements in the United States;

- Wariness of United States lending institutions toward supporting private infrastructure initiatives;

- Participation by international banking institutions such as the World Bank and IFC in supporting infrastructure projects in less-developed countries.

Because of the limited experience with turnkey in the United States, turnkey projects are still largely supported by public funding and conducted on an "experimental" basis. While this method of financing and building projects has been utilized more in the private sector for utility projects or toll roads, it has not been applied extensively to transit projects. This has occurred mainly because of the limited potential for generating a steady stream of operating revenues from the project to repay debt. To facilitate the development of more turnkey projects, project sponsors must develop more opportunities for generating revenue for transit projects through innovative public-private partnerships and/or non-operating revenue sources.

PART II

PROJECT MANAGEMENT CONTROL RESOURCE PAPER

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PROJECT MANAGEMENT CONTROL RESOURCE PAPER

BOOZ·ALLEN & HAMILTON INC.

ABSTRACT

Transit agencies are increasingly interested in methods to reduce project completion schedules and, potentially, reduce developmental costs. Turnkey project delivery is under consideration by the Federal Transit Administration (FTA) as an alternative project development approach that may provide these benefits of decreased project schedule and reduced developmental cost. The FTA established a mechanism to examine the potential for these benefits through the Turnkey Demonstration Program. The turnkey method has been used in the development of public and private infrastructure projects outside of transit in the United States and for transit projects worldwide for several decades. The United States transit industry is now positioned to demonstrate whether there are measurable results from the implementation of the turnkey procurement process in the development of five major fixed guideway transit projects.

As research into the benefits, impacts and process modifications of the turnkey method progresses, one key area that is consistently raised by agency and contractor representatives is the implications for project management control functions. The goal of this paper is to document the key issue areas encountered in project management for turnkey projects, describe the extent of control functions utilized and highlight the initial lessons learned in project management control for the Turnkey Demonstration Program projects.

This paper focuses on project management control, which differs from project oversight. Oversight may be considered to be fulfilling the responsibilities of maintaining satisfactory continuing control of the funds, services and assets acquired by public agencies with public funds, particularly Federal funds. The ongoing project oversight role continues to ensure proper use and stewardship of public resources for public projects, regardless of the chosen project development approach. Project management control focuses on the contract mechanisms an owner employs to achieve successful implementation of a project contract. Schedule management, cost control, payment mechanisms, quality assurance and quality control, monitoring and reporting, and change order processing are among the project management functions highlighted in this paper. Project management functional responsibilities support and often serve as a subset of oversight processes, but oversight responsibilities typically are independent of the ongoing project management functions and may occur through additional mechanisms and parties separate and distinct of the management functions.

This paper examines owner and contractor organizational issues related to turnkey project management control and the realignment of some of these project management functions. The paper identifies implementation issues that owners and contractors have initially experienced under the turnkey method. The paper also examines the relationship between turnkey project management and Federal guidelines, including the FTA's *Third Party Contracting Requirements, Grant Management Guidelines* and *Project and Construction Management Guidelines*. Based

on these practical experiences, the paper presents initial findings and outlines initial lessons learned from project management control for turnkey projects.

This document combines this examination of turnkey projects underway with a selective review of comparable, conventionally procured transit projects; particularly, in regard to the practical implementation of project management control requirements. This comparison is intended to identify issues related to project management control so that owner agencies can provide anecdotal evidence from their experiences with turnkey project implementation. It is also hoped that information presented and issues raised through this analysis will provide ongoing assistance to transit agencies and additional industry groups in exploring opportunities and issues associated with project management control under the turnkey method. The combination of the Turnkey Demonstration Program research, the initial lessons learned results from the program projects and the contributions of these industry outreach efforts will provide the foundation to the upcoming status report to Congress.

EXECUTIVE SUMMARY

Project management is a critical process to ensure that projects are implemented in a cost effective and timely manner while meeting project specifications. At the same time, the extent of management control is a function of the complexity and duration of the overall project, making its value less obvious and tangible. Since project management control does not result in actual productive output it may be viewed as drawing resources from other functional output expenditures required to complete the project. The goal of this paper is to document the key issue areas encountered in project management for turnkey projects, describe the extent of control functions utilized and highlight the initial lessons learned in project management control for the Turnkey Demonstration Program projects.

Assessing the value and determining the preferred role of project management control presents one of the key challenges for the owner agency. The focus of this research is to concentrate on this evolving process of selecting a reasonable balance to the role of each of the major project organizations and the extent of project management control functions assigned to each of these roles.

- Schedule Management and Control
- Progress Payments
- Cost Control and Job Accounting System
- Technical and Scope Configuration Control
- Change Orders and Claims Management
- Quality Assurance/Quality Control Program
- Owner Monitoring/Contractor Reporting
- Subcontractor and Disadvantaged Business Enterprise (DBE) Management
- Escrowed Bid Documentation
- Verification/Close-out and Project Delivery

It is this selected balance in the turnkey environment that will eventually define the level of management control appropriate to the specific project risk and procurement methodology.

Turnkey Project Management Roles

The turnkey procurement process introduces a new perspective on a traditionally well-defined process that must be addressed in determining the level of management control — the role of the turnkey contractor and agency. Under turnkey, the turnkey contractor is given responsibility for overall project execution, including assuming selected roles in project management typically reserved for owner agency staff and/or consultants. The turnkey projects examined for this paper appear to reflect an overall high level of project control by the owner agency for the informational and systems aspects of management. Other functions of project management, such as project scheduling, quality control, systems integration and configuration control, are shared with the contractor at varying levels of responsibility depending on specific local preferences,

agency capabilities and other project influences. Note that the level of control referenced in this paper refers to the actual cost and level of resources devoted to the individual project management functions and to the level of active monitoring by the owner and level of reporting requirements for the contractor.

Owners rely heavily on project management systems to implement their control responsibilities. Project management control systems have been used to provide a mechanism for owner agencies to retain visibility over a turnkey project that is provided by agency staff on a more conventionally contracted project. Increased monitoring functions through requiring more detailed cost, payment, progress and schedule reporting have been used to enhance the owner's communication with the turnkey contractor. Enhanced project management requirements can serve as a means for the owner to retain an informational control over the project at the key decision points while still providing the increased allocation of risk and responsibility to the contractor under the turnkey contract. An owner's culture can thereby foster greater innovation through turnkey while encouraging high levels of project management systems control since both approaches support a similar goal of advancing the project as quickly and cost-effectively as possible.

Turnkey Project Management Reporting

The level or extent of management control for a specific project is also influenced by the developmental conditions of the project and the capability of the local owner agency. The combined owner and contractor resources applied to the various management control functions are a function of local area, agency and project developmental aspects.

- Nature of the turnkey project
- Size and scope of the project
- Experience base of the existing owner agency staff
- Right-of-way location
- Whether the project is a new start or extension.

More complex turnkey contracts, such as design/build/operate/maintain contracts, typically have demonstrated a higher level of applied resources and systems control by the owner than that found in the lower cost and less complex civil design-build contracts. However, the level of project management control within a project also varies from individual project management function, even within the same project.

FTA Rules and Guidelines

FTA's efforts in recent years to provide owners with increased flexibility and authority necessary to implement modified project management control practices have eased the procurement and administration requirements for grantees, with benefits for both turnkey and conventional projects. However, several areas, for potential refinement particular to turnkey projects, are

discussed below; these and additional issues may be identified in the future based on Turnkey Demonstration Program project experiences.

- More unique agency/contractor payment methods, such as those included in the financing strategy of the NJ Transit HBLRTS, require coordination with FTA and may indicate additional review required for progress payment reporting mechanisms outlined in FTA's *Third Party Contracting Requirements* (FTA Circular 4220.1D).

- The FTA value engineering requirements presented in FTA's *Grant Management Guidelines* (FTA Circular 5010.1B) and *Project and Construction Management Guidelines* may need to be modified to account for the inherent value engineering incentives already reflected in the combined design-build functions within the turnkey contracting structure.

- Further research into existing lease and equipment management guidelines presented in FTA's *Grant Management Guidelines* (FTA Circular 5010.1B) may identify issues regarding satisfactory continuing control and monitoring of FTA-funded assets under those turnkey contracts during the operations period.

- The FTA Project Management Plan requirements may benefit from selected revisions to better accommodate turnkey issues of contractor roles in project management, with attention to the schedule monitoring and QA/QC programs.

The timing for the full funding grant agreement has historically occurred after the final design phase for conventionally-contracted projects; but for turnkey, must be moved forward in the project development process to follow preliminary design. Federal funding commitment can then be reflected in the turnkey project finance plan and procurement process, demonstrating the agreed Federal funding amount and thereby attracting the widest contractor competition.

Turnkey Project Management Control Initial Lessons Learned

Turnkey projects underway in the United States exhibit a variety of approaches to assignment of management control responsibilities, with no one pattern applicable to all projects. However, several trends are developing that point toward a preferred approach to individual aspects of project management functions. Additional key lessons learned to-date regarding project management control within the turnkey environment are listed below.

- The type of project, owner organization, and nature of the turnkey contract influences the level of project management control required by the agency, with more complex and longer term contracts demonstrating a higher level of pre-planned management systems control by the owner.

- An owner's culture can foster innovation through turnkey while maintaining high levels of project management control since both approaches can be used to support a similar goal of advancing the project as quickly and cost-effectively as possible.

- Development of project management roles and responsibilities should receive significant attention prior to the development of the procurement process, with the contract providing clear definition of owner and contractor roles and reporting responsibilities.

- Combining schedule management, progress payments, and cost control through the cost-loaded schedule process can provide owners with a high level of monitoring while streamlining the required resources for the overall project management process.

- The owner and contractor must carefully define the quality assurance/quality control (QA/QC) program — particularly the roles and responsibilities — within the bid documents so that participants are clear as to requirements and potential conflicts of interest are avoided; the owner may have to provide initial focused monitoring to ensure the program is functioning properly.

- The complexities of the turnkey contract actually may require additional levels of reporting and/or detail by the contractor team and a more thorough review by the owner staff to ensure the specifications are being met and progress is as agreed.

- Turnkey contracts may require that the owner raise the threshold amounts for change orders/claims requiring senior staff approval so that staff have necessary authority to advance the project and make decisions at the appropriate organizational level.

This paper presents the initial issues and lessons learned experiences associated with project management control by the Turnkey Demonstration Program projects. However, given that the United States' transit turnkey experience is somewhat limited and mainly recent, current impact data and experience documentation available to the program is primarily developed from the available information base which emphasizes the owner's perspective. Outreach forums such as the Workshop on International Transit Turnkey and Joint Development assist in enhancing this base of information to expand further into the contractor and international perspectives. In addition, a more detailed evaluation of the procurement and construction phases of turnkey projects through the FTA Turnkey Demonstration Program will provide for the contractor perspective and allow for a more quantitative analysis of staff resources dedicated to project management control from owners, consultants, and turnkey contractors.

BACKGROUND

The turnkey procurement method involves the consolidation of several contracting and functional roles — traditionally the responsibility of numerous contracting entities — under the umbrella of a single design-build or design-build/operate and maintain contract. The variations of design-build approaches employed in transit projects impact an owner agency's and contractor's role in project development, including project management and responsibilities. One area of particular interest is the level of project management control exerted by owners and contractors under a turnkey contract as compared to conventional procurements. Note that level of project control is not limited to the staff resources dedicated to project control. Rather, it indicates the individual roles and extent of the reporting relationship between the owner and contractor as reflected by the owner's visibility in management of project phases.

Turnkey Demonstration Program

This research is being conducted within the context of the FTA Turnkey Demonstration Program. The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 included Section 3019 that required the FTA to develop a program to demonstrate the application of turnkey contracting practices in the development of major transit capital projects. In response, the FTA developed the Turnkey Demonstration Program and selected four projects for inclusion:

- Baltimore Central Light Rail Line (CLRL) Extensions — Baltimore, Maryland
- San Francisco Airport Extension — San Francisco, California
- San Juan Tren Urbano — San Juan, Puerto Rico
- Union Station Gateway Project — Los Angeles, California

In addition to these turnkey program projects, the Hudson-Bergen Light Rail Transit System (HBLRTS) in northern New Jersey has been interacting with the program and contributing to the lessons learned from the program.

Objectives

This paper examines project management control within the context of the turnkey projects included in the FTA Turnkey Demonstration Program and several conventional projects selected as comparison points. The goal of this paper is to document the key issue areas encountered in project management for turnkey projects, describe the extent of control functions utilized and highlight the initial lessons learned in project management control for these first five turnkey projects. The paper has established several objectives to guide research into turnkey project management control. Specifically, this paper sets out to:

- Identify project management control as a key turnkey program issue of interest
- Discuss organizational aspects of project management control within the turnkey environment

- Identify potential implementation issues regarding turnkey project management control and document lessons learned
- Discuss turnkey project management control within the context of FTA rules and procedures

These objectives assist in structuring the approach to be applied and serve as a benchmark against which to assess findings and identification of issues for further research.

Project Oversight and Project Management Control

In order to understand unique aspects of project management control within the turnkey environment. it is first important to clearly distinguish what is meant by project oversight and project management control. Oversight may be considered to be fulfilling the responsibilities of maintaining satisfactory continuing control of the funds, services and assets acquired by public agencies with public funds, particularly Federal funds. The ongoing project oversight role continues to ensure proper stewardship of public resources for public projects, regardless of the chosen project development approach. Project management control involves the specific contract mechanisms an owner employs to achieve successful implementation of a project. Project management functional responsibilities support and often serve as a subset of general oversight. But oversight responsibilities generally are independent of the ongoing project management functions and may occur through additional mechanisms and parties separate and distinct of the management functions. This paper focuses on the role of project management control within the turnkey method and does not attempt to address general oversight functions that are an ongoing requirement of public agencies.

Project management control may be considered to be comprised the methods an agency employs in order to achieve the same result — successful implementation of project development. The FTA's *Project Management Construction Guidelines* provide clarity to the definition of project management by noting that "successful project management is defined as having achieved the project objectives within budget and schedule at the desired performance level, while using the assigned resources effectively and efficiently." [1] Project management control implies both a qualitative and quantitative assessment of overall project developmental performance.

Project management control extends across the life of the project, from initial project planning to revenue testing and system start-up. It involves adequately planning for the project and accurately monitoring the project as it proceeds. Aspects of project management control may vary depending upon the size and scope of a particular project. However, several basic goals tend to be applied in implementing project management control regardless of the project in question. These standards of management include:

- Consistent Proposal Evaluation Standards
- Communication Basis of Project Objectives
- Budget and Cost Management
- Schedule Management

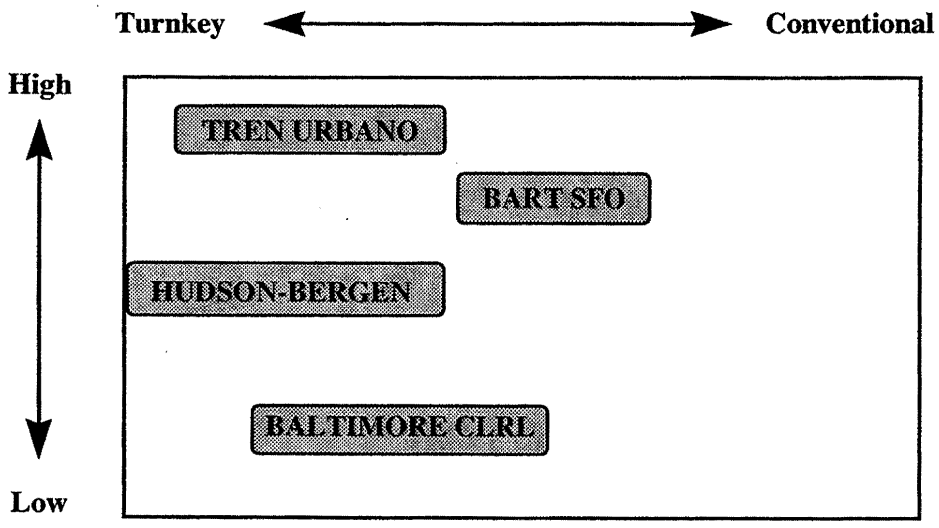
- Performance Criteria
- Effective and Efficient Resource Allocation
- Progress Payment Mechanism
- Claims and Change Order Pricing Basis
- Technical and Scope (Configuration) Control
- Quality Assurance

Each of these standards guides the management control process throughout the course of the project. These standards were used in the development of the project management control issues and the documentation of the project process to-date within each of the management control process issue areas.

PROJECT MANAGEMENT CONTROL: TURNKEY ORGANIZATION

As noted in Figure 1, the Turnkey Demonstration Program projects examined for this paper appear to demonstrate an overall high level of project control. The level of project control is reflected by the actual cost of resources devoted to project management and the level of active monitoring by the owner and level of reporting requirements for the contractor. While it appears that projects reflect an overall high level of project management, that degree of management may not apply unilaterally across all project control functions. For example, an agency might implement a strong level of control over schedule, reporting and payments, but rely on a lower level of design monitoring for the project. This raises the issue of whether certain project control requirements necessitate a higher level of informational and systems control to balance with a lower level of direct monitoring under the turnkey method. The following sections of this paper explain how owners and contractors assume responsibility for project management control and the degree to which the selection of the procurement method or other factors external to the procurement method impact the level of project management control.

Figure 1
Level of Project Management Control



General Project Organizational Issues

The turnkey projects currently underway or planned in the United States do not demonstrate a uniform approach to project management. Just as each project has undertaken various forms of turnkey procurement strategies, so has each project tailored its approach to project management to meet specific project needs. Turnkey contractors typically are assigned increased project management responsibility under turnkey, although the level assumed by the contractor depends upon the requirements of the respective contract. As noted in Table 1, project management responsibility is general shared among the owner, turnkey contractor, general engineering consultants, and other subconsultants to the owner.

TABLE 1
Responsibility for Project Management Control

Project	Procurement Method	Owner	GEC	Other Consultants	Turnkey Contractor
Baltimore CLRL Extensions	Modified Civil D/B	X		X	X
BART San Fran. Airport Extension	Modified Civil D/B	X	X		X
NJ Transit HBLRTS	Full DBOM	X	X	X	X
San Juan Tren Urbano	Modified DBOM	X	X		X
Baltimore CLRL Phase I	Conventional	X		X	
BART Colma Station Project	Conventional	X	X		

The lack of a standard approach to project management control within the turnkey environment appears to indicate that the project management approach for a project is not a sole result of the influence of the turnkey contract. Instead, the level of project management may result from a variety of influences, including owner culture, experience base and organizational preferences, contractor experience with the turnkey method in transit projects, and other factors external to the selection of the turnkey contracting mechanism. The mix of owner and contractor perspectives with these factors influences how an owner structures project management requirements and how that management approach is implemented.

Type of Turnkey Contract

The turnkey contract selected, both reflects owner culture and influences the form of management control initiated and followed throughout the project. Projects that follow an organizational structure closer to a design/build/operate/maintain (DBOM) approach demonstrate a higher level of overall project management control, with an even higher level of management reporting systems provided on the part of the owner agency (or through its consultants).
The DBOM approach groups many requirements under one consortium or project team, and the complexity of such a large contract requires a higher level of project management reporting.

San Juan Tren Urbano project is a modified DBOM contract, with the owner retaining a high degree of project control through extensive progress and payment reporting requirements and lower level role of design review and construction management. The other DBOM project underway in the United States, the NJ Transit HBLRTS, indicates that the owner is exerting a somewhat lower level of project management control than San Juan. The higher level of project management control for each of these projects is concentrated more within the reporting systems and less in the management type functions.

The introduction of multiple civil design-build contracts outside of the prime turnkey contract results in additional requirements for project management. Both the San Juan Tren Urbano project and the BART San Francisco Airport Extension project involve multiple design-build contracts and both owners exhibit a high level of project management systems control. The San Juan Tren Urbano project requires an additional contractual interrelationship among the Systems

and Test Track Turnkey (STTT) contractor team and the other six civil segment design-build contractor teams. This provides additional layers of communication among contractors requiring that the STTT contractor assume a stronger role in management and coordination of the operational, systems and particularly the civil elements.

A less complex turnkey contract may provide the opportunity for a reduced level of overall project management control due to the lessened project complexity and the reduced number of project participants. The Baltimore CLRL Phase Extensions project, for instance, follows a civil design-build contract format that excludes the systems elements and is composed of three extensions to an existing light rail line that has an established design approach. The owner initially planned on a less stringent level of project management control than under a comparable conventional project, the Baltimore CLRL Phase I project. Some responsibilities for project management were passed along to the design-build contractor, but actual implementation of project control remained at a fairly low level of detail, subject and frequency.

However, the Maryland Mass Transit Administration (MTA) has subsequently encountered several QA/QC monitoring and ongoing progress reporting issues that would have been identified earlier in the project and have less delay impact with a more robust project management approach. The MTA has also appended a project management contractor to their agency team and expanded the project management responsibilities of the design-build contractor in response to these issues. A less complex turnkey contract may lead to a lower level of project management control required for project implementation, but it should not be reduced to the extent that it decreases the contractor and owner agency visibility to the point where it begins affecting progress.

Size and Scope of Project

The size and scope of the project affects management requirements, from the level of cost control to the complexity of configuration control. Projects more complicated in cost and scale result in additional complexities for overall project management control by the owner and contractors.

TABLE 2
Project Complexity and Project Management

Project	Procurement Method	Estimated Project Cost (Millions)	Length (Miles)	Relative Level of Proj. Mgmt.
Baltimore CLRL Extensions	Modified Civil D/B	$ 106	7.3	Low
Baltimore CLRL Phase I	Conventional	$ 364	22	Medium
BART Colma/East Bay Project	Conventional	$ 624	27	High
NJ Transit HBLRTS	Full DBOM	$ 755	10.5	Medium
BART San Fran. Airport Extension	Modified Civil D/B	$ 1,100	6	High
San Juan Tren Urbano	Modified DBOM	$ 1,250	10.7	High

As noted in Table 2, there appears to be a slight correlation between project cost, which is often reflective of the scale of a project, and the level of overall project management required. More extensive and complex projects require a higher level of project control; whereas projects of a smaller scale are better candidates for a lower level of project management, whether turnkey or traditional contracting methods are used.

The inclusion of the systems design and development can both increase project costs and greatly expand the overall project management control required. For example, San Juan Tren Urbano and NJ Transit HBLRTS involve design, supply and implementation of all systems elements, increasing complexity, cost, and project management required. The Baltimore CLRL Extensions rely on existing systems technology and design, which helps to reduce the level of project management control required. Therefore, systems elements have a direct bearing on the necessary extent of the project management control functions.

Right-of-Way Location

The alignment of a specific project or section of project can increase project risk and the management techniques required to overcome the associated risk.
While all of the projects examined for this paper are located in urban areas, the specific alignment geography and right-of-way location can present additional challenges that require increased management by the turnkey contractor and owner.

Both NJ Transit HBLRTS and the San Juan Tren Urbano projects are to be constructed in dense urban areas, with special attention to the surrounding right-of-way location. Each of these projects demonstrates a higher level of project management control. For example, San Juan Tren Urbano includes tunneling requirements through the historic district of Rio Piedras. This is a separate design-build contract from the overall turnkey (STTT) contract. Special dispute provisions to address potential geotechnical problems are among several contract provisions which indicate an increased level of project management control.

The BART San Francisco Airport Extension alignment also presents challenges with design and construction of the crossover into the airport. In contrast, the Baltimore CLRL Extensions represent a less complicated light rail, mainly at-grade alignment. This may have had some contributing effect upon the lower level of project management required for the Baltimore CLRL Extensions, although the Penn Station Extension aerial alignment and BWI Airport Extension present a certain degree of higher civil complexity. It would appear that the relatively lower level of project management initially considered for this MTA light rail extensions project may have been appropriate given the alignment characteristics, but insufficient for other reasons.

Extension or New Start

Extensions to existing systems often are less complex since they are building upon existing technology and train control technology. Extensions may consist primarily of civil design-build work, with some systems expansion required along the selected line. New start projects must

address additional complexities of initial systems development, including the introduction of proprietary and innovative technology, which can result in additional levels of project control.

The NJ Transit HBLRTS project represents a new start project and indicates an average level of overall project management reporting control with the contractor, although its GEC does possess a fairly high level of management responsibility over the DBOM contractor. In contrast, a lower level of project management control is provided for the Baltimore CLRL Extensions than for the initial CLRL Phase I project. The MTA is devoting fewer resources to overall project management, and it would appear that previous experience with the CLRL Phase 1 may have resulted in Baltimore assuming a lower level of project control with the Extensions (although they MTA did add a project management consultant to their agency role). In addition, the Extensions rely on existing technology and do not require the contractor to initiate new forms of train control or other complex systems requiring integration issues. On the other hand, BART demonstrates a consistently high level of project management control in both the Colma project (an extension in theory) and the San Francisco Airport Extension. This may be more due to agency culture and project visibility preferences than turnkey contracting formulations.

Owner Organizational Issues and Approach

Owners rely upon a variety of processes to determine the level of project management control for a particular project. Project complexity, project alignment, and previous experience with a project of this nature influence an agency's approach to project management. In addition, the owner's organizational culture and previous experience impact the division of project management responsibilities.

Owner Organizational Culture

An owner's organizational culture influences the choice of procurement and approach to management. Turnkey requires transit agencies to assume some degree of flexibility and innovation and to transfer certain responsibilities to an outside entity. Yet an organization that may allow flexibility through the implementation of the turnkey method often may require more stringent techniques for project management. However, the end goals of the adoption of the turnkey method and implementation of a high degree of project control are actually the same: advance the project as quickly and cost-effectively as possible. Turnkey is not necessarily viewed as an end, but rather a management tool to the end goal of successful project execution. In the same way, a high level of project management is not an end, but a means to that end and as a mechanism to better ensure that the project is advanced efficiently.

The management style that fosters adoption of the turnkey procurement method may also be likely to result in a higher reliance of the project management control systems by the owner and somewhat less direct staff monitoring. Owner agencies supportive of the turnkey approach require senior managers with a hands-on approach to the initial project development phases and then a less direct and detailed role in the implementation phases. This type of turnkey-oriented agency and general manager will need to be fully aware of the developmental details of the

project, and then be comfortable enough to step back from the day-to-day issues of project implementation to a more strategic role appropriate to turnkey project management.

This turnkey-friendly management culture will also require that agency management staff maintain the authority to make quick decisions to ensure continued advancement of the project within the turnkey developmental environment. This increased decision-making authority can assist in advancing the benefits of turnkey by maintaining the higher implementation momentum garnered by a turnkey project. This turnkey-oriented management style may also encourage an increased level of project management informational and systems reporting by the agency, which can result in a higher level of project management control but without the increased cost by depending more on the management control systems.

Several of the turnkey projects examined as part of this paper reflect a strong commitment of senior management to detailed project development monitoring. BART's senior management have taken a high level interest and visibility approach to all of the East Bay and Colma traditional projects and the San Francisco (SFO) Airport Extension turnkey project. BART management has provided high levels of support and involvement to advance both types of projects and a corresponding interest in maintaining close scrutiny over progress and developmental decisions. Support by senior management of the design-build turnkey method for the SFO Airport Extension resulted in the continued use of this extensive level of project management control by the agency. Therefore, BART demonstrates a significantly high level of project management control for both types of projects, traditional and turnkey, as evidenced by the comparable roles and levels used on the Colma project and the Airport Extension.

The San Juan Tren Urbano project reflects a similar approach to project management. Senior managers of the owner agency for Tren Urbano are vested with a high level of decision-making authority and responsibility. The Secretary of Transportation has extensive decision-making authority for project approval, which provides a high level of responsibility for project implementation. This authority is passed along to senior management with the expectation for a high degree of accomplishment within a shortened timeframe. With the increased authority, however, comes increased responsibility and accountability for project success or failure. The recognition of this accountability appears to be one motivation to reach for a higher level of project management control for progress and payment reporting. The style of management not only provides authority to monitor closely project development, but also the responsibility to achieve the desired end and the necessity to do so to ensure success.

Previous Experience in Project Development

An owner's experience with other projects influences its approach to project management under the turnkey method. BART's proposed project management approach for the San Francisco Airport Extension has several similar elements to the Colma Station Project. Both projects rely heavily on the cost-loaded schedule to serve as a means of schedule and cost control and to provide the progress payment process. While BART has expanded QA/QC requirements for the design-build contractor, the basis for the QA/QC program and other project control mechanisms draw heavily upon those experiences based in the Colma Station traditional project process.

An owner may have worked with a contractor before, either directly or indirectly, and this can help define the level of project control provided by an owner. An owner and contractor may be more familiar with one another's culture and organizational structure, leading to a more trusting project environment. For example, the design-build contractor for the Baltimore CLRL Extensions has had a long standing relationship of contracting with the State of Maryland.

While the CLRL represented the contractor's first job for the owner, both participants had a degree of understanding of one another's culture, approach to management and commitment to a successful conclusion.

Owner Organization and Responsibilities: Turnkey vs. Conventional

As noted previously in Table 1, the turnkey projects reviewed for this paper demonstrate a shared approach to project management among the owner, consultants, and turnkey contractor. Roles of the owner and the owner's representatives (i.e., GEC, GMC, etc.) are explored below. Note that responsibilities of turnkey contractors for project management are discussed in the subsequent sections. In addition, further detail on each project is provided in Appendix A.

Baltimore CLRL Extensions: The CLRL Extensions project demonstrates a relatively low level of owner management control, especially in comparison to the original CLRL project. There are fewer owner staff dedicated to project management, partially due to the reduced scope of this project. However, the owner also demonstrates evidence of reduced staffing in anticipation of passing particular management reporting responsibilities along to the turnkey contractor. Note that the owner still relies on field staff (Resident Engineers) to have a direct role in ongoing field management. They retain daily logs and recommend actions on designs, change orders, schedule modifications and progress payments.

BART San Francisco Airport Extension: The owner's project team (which includes the GEC) retains a high level of project management control, although a limited amount of responsibility will be passed on to the design-build contractor. BART's project team includes representatives from BART's administrative, engineering, and construction areas as well as key staff from the GEC and other project consultants. The field staff (Resident Engineers) play a more limited role in overall project coordination than under conventional procurements. However, they still maintain payrolls and monitor contractor performance through inspection and a reduced level of QA monitoring.

NJ Transit HBLRTS: This project plans indicate that the owner will retain overall project monitoring roles, with a turnkey-oriented shift in responsibilities. Responsibility is planned to be shared with the owner agency (NJ Transit) and the selected GMC (referred to as a PMAC), with other consultants providing assistance as appropriate. The preliminary Project Management Plan indicates that primary responsibility for construction management will be given to the DBOM contractor, although the owner will monitor activities through scheduled program reviews.

- ***San Juan Tren Urbano:*** The owner retains a high level of project control, although many of the management functions are implemented through the owner's representative, or GMAEC. The owner acts as the contracting authority for the Systems and Test Track Turnkey (STTT) contract and the six design-build contracts (Alignment Section Contractors or ASCs). The owner, through the GMAEC, monitors each contract's progress and receives reports from the contractors. There is a somewhat lower level of owner field staff involvement, although they still assume responsibility for recommendation of acceptance.

- ***Baltimore CLRL Phase I:*** The owner was responsible for project management control, with some construction management assistance received from consultants. The owner followed an informal method of schedule monitoring and retained cost control functions separate from schedule management. Resident Engineers had a strong role in contractor management, with field audits conducted directly by them.

- ***BART Colma Station Project:*** The owner had the primary role of project management, with the GEC and construction management consultants coordinating interface with the contractors. The GEC was responsible for cost control and coordination of the schedule and consolidating information for the overall project. Field staff also played a strong role by reviewing monthly schedule and progress payment reports and administering change orders and authorizing progress and cost data

Owners and their representatives tend to retain a high level of project management in turnkey procurements, particularly for the progress reporting and payment mechanisms. This may be a reaction to the lessened role in the design and construction details. General Engineering or Management Consultants (GEC, GMC, PMAC, or GMAEC) play a strong role as liaison between the owner and the turnkey contractor. Each of the turnkey projects, with the exception of the Baltimore CLRL Extensions, relies on the GEC contractors to assist with project management functions. This impacts the overall owner staff effort devoted to project management in turnkey. On initial review, it may appear that the owner has fewer agency staff dedicated to a project which may not reflect internal "staffing up" sometimes associated with a large-scale transit project. Instead, some of the additional staffing is likely diverted to the GEC/GMC and turnkey contractor organizations as they assume responsibility for monitoring implementation functions.

Owners, although to a lesser degree, also continue to rely upon field staff or resident engineers as part of project management and monitoring in the turnkey environment. While staff may share some responsibilities with the turnkey contractor, they are still involved in many of the quality assurance and progress monitoring functions required under the conventional environment. Resident Engineers play a role in each of the turnkey projects reviewed, and are responsible for review, inspection, and authorization in most of the projects.

Contractor Organizational Issues and Approach

Turnkey contractors assume additional project risks and responsibilities for project advancement under the turnkey method, requiring an increased focus on project management as compared to conventional procurements. The turnkey contract defines expectations of the contractor in regard to project management. The contractor's culture and previous experience with the turnkey method can influence how it implements responsibilities provided under the turnkey contract.

Note that of the turnkey projects underway to date, only Baltimore has had a turnkey contractor under contract for any length of time. San Juan only recently initiated its STTT contract, in May 1996. Observations regarding contractor roles in terms of project management are derived primarily from planned organizational reporting requirements outlined in procurement and other project documentation. Additional documentation regarding the contractor perspective as projects move forward into implementation will assist in expanding upon this base of information and widen the perspective to include more of the contractor interests.

Contractor Organizational Culture

A contractor's organizational culture has a strong influence on its ability to adapt to increased project management requirements under the turnkey method. Certain approaches by the contractor can assist in facilitating both the relationship with the owner agency and the implementation of project management control systems included in the turnkey contract.

The ability to consider the broader project perspective is helpful to turnkey contractors in implementing increased requirements of project management control. Rather than focusing on an individual segment of the project, the turnkey contractor must take a broad perspective of viewing the project as a whole. This expanded responsibility often requires that the contractor assume responsibility for managing project functions not normally of concern to the individual contractor. For example, under the Baltimore CLRL Extensions contract, Whiting Turner — a civil engineering firm — is providing oversight to Mass Electric — the firm responsible for signal design. This requires Whiting Turner to understand the broader issues associated with signal design and the implications of those issues on other project components so that those aspects of the project can be managed effectively.

The Whiting Turner example also points to the fact that turnkey contractors must manage areas not previously under their realm of responsibility or direct expertise. This requires an understanding of the overall project issues to handle turnkey project management most effectively. Whiting Turner and, in particular their subcontractors, faced several challenges in resolving the differences between turnkey and conventional contracting through the signal design, procurement and supply phases, which led to some schedule delays to the Baltimore project. The contract was behind schedule for design reviews, which appeared to be based on a more conventional signal design contracting approach and a possible lack of direct experience with the turnkey contracting, communication and review differences.

The introduction of increased interface with other project participants under turnkey — whether the owner, other consortia team members, or other contractors — requires that the turnkey contractor accept a certain amount of flexibility to adapt to other project management styles. The turnkey contractor may benefit from an enhanced appreciation for the goals and style of the owner agency staff as well as other participants within the contractor and agency teams. One process through which owners and contractors may initiate a shared culture is through partnering. The Baltimore CLRL Extensions, the BART projects, and the San Juan Tren Urbano project include partnering as part of their projects. This is an attempt to build the project relationships on a positive note as the project enters the turnkey implementation phases.

Partnering serves as a mechanisms to "create an environment where trust and teamwork prevent disputes and where a cooperative bond is established between owner and contractor to facilitate completion of a successful project."[2] An open level of communication assist in turnkey management to encourage the contractor to be able to approach the owner regularly with any management concerns as they arise. At the same time, the level of trust created through partnering may encourage a degree of informality that could decrease project accountability and reporting requirements. A culture of excessive trust in absence of written communication can lead to omission of key management requirements by both contractor and owner.

In the case of the Baltimore CLRL Extensions project, the added levels of trust from the partnering agreement may have contributed to the greater flexibility shown by the contractor team in reassigning its work effort around owner agency constraints. There were several occurrences that impacted the individual schedule requirements in 1995, but the owner did not receive claims from minor right-of-way access limitations that the contractor could have claimed from the contract. The MTA maintained this partnering perspective as it raised the signal issue with the contractor, and both sides maintained a positive perspective through the discussions. This could indicate a weakness in overreliance on partnering, but the more likely lesson learned from this may indicate the need for owners to maintain a sufficient minimum level of project management control over the contractor.

Previous Experience in Turnkey Project Development

A contractor's previous experience with the turnkey method can assist with handling the added management responsibilities ranging from cost/schedule control to QA/QC programs under the turnkey contract. One of the challenges for the Baltimore CLRL Extensions project was for the design-build contractor to fully assume the increased project management responsibilities. While the contractor had experience in turnkey construction of other public works projects, the Baltimore CLRL Extensions represented the prime contractor's first transit project. In addition to delays in implementing schedule management functions, the contractor had difficulty in implementing the QA/QC program as outlined in the contract documents. The owner and FTA worked closely with the contractor in this implementation process. While other factors may have influenced these difficulties with project management implementation, additional experience in turnkey construction likely would have assisted in resolving some of these difficulties in a more timely manner.

Contractor Organization and Responsibilities: Turnkey vs. Conventional

As noted in Table 1, turnkey contractors assume a fair level of responsibility for project management under the turnkey method. Highlights of the project management requirements for contractors in the turnkey projects are discussed below. Further detail on each project is provided in Appendix A.

Baltimore CLRL Extensions: The design-build contractor is provided with increased responsibility for schedule management and cost control, with monthly reports to be provided to the owner according to contract documents. The design-build contractor also has increased responsibility for QA/QC functions and is required to develop and implement a configuration management plan and control procedures. Testing and integration of the completed system is shared between the owner and contractor.

BART San Francisco Airport Extension: As part of contract requirements, the design-build contractor is expected to assign a professional engineering firm to perform construction management. The design-build contractor is to develop a cost-loaded schedule, which drives progress payments and cost control. The contractor also is responsible for development and implementation of a configuration control mechanism to provide coordination among other contractors. An expanded QA/QC program is also required. The design-build contractor assumes additional management responsibility to assist in the interface between procurement and construction contracts.

NJ Transit HBLRTS: The DBOM contractor will receive primary responsibility for overall construction management review, with the owner providing overview of construction activities through the approved QA/QC program. The DBOM contractor also coordinates performance of work of other contractors (i.e., fare collection, etc.) as part of systems integration phase. The DBOM contractor also has requirements for schedule submittal, although it appears that much of responsibility for schedule and cost control remains with the owner and its GEC contractor.

San Juan Tren Urbano: The owner and owner's representative retain direct contract and management authority for the STTT contract and the six ASC contracts. The STTT contractor does not have direct authority or management responsibility for the ASC contracts. However, the owner does provide the STTT contractor with responsibility for submittal of its QA/QC program and plan, and continued internal monitoring control for quality for its work. The STTT contractor was granted some degree of interface and management supervision with the ASC contracts since the progress and product of their work is so closely interrelated. The STTT contractor is provided the right to review and comment upon the design and construction activities performed by ASCs. In addition, each contractor is provided with increased responsibility for developing detailed schedule and cost estimates following the contract award.

Contractors are provided with increased internal coordinating responsibility for project management control under the turnkey environment. However, individual responsibility may

vary depending on the needs of the particular project or organizational structure for participants. The turnkey projects examined all provide the turnkey contractors with added responsibility for development and implementation of the QA/QC program and plan. Contractors also appear to assume additional responsibility for development and implementation of systems integration and configuration control mechanisms.

As turnkey contractors assume these increased responsibilities, they must be equipped with the technical knowledge required for successful project management implementation. As the Baltimore CLRL Extensions experience indicates, it is helpful for contractors to be familiar with construction management and systems integration functions, including schedule management requirements, configuration control mechanisms and quality control programs. It is also important to clearly define the roles and responsibilities of the owner staff and their consultants and the turnkey contractor and their individual subcontractors once the project is underway. This is a joint responsibility of the owner and contractor to ensure that project management functions will be implemented and maintained throughout the project developmental period and as envisioned in the contract documents.

PROJECT MANAGEMENT CONTROL: TURNKEY IMPLEMENTATION

This section examines how management control systems are used within turnkey projects by both the owner and the turnkey contractor. Much of the following discussion relies upon planned implementation of project management systems and methods described in the individual project materials, particularly the contract documents. Since only a few of the turnkey projects have advanced into the construction stage, the full extent of demonstration project lessons learned are still to come. Specific observations and initial findings from these Turnkey Demonstration Program projects are noted, with more detailed documentation included in Appendix A.

Schedule Management and Control

The development and management of the schedule serves as a critical link among this and all of the other management systems. Of particular interest to the overall project management control issues is the identification of projects using the cost-loaded scheduling method. Under the cost-loaded schedule approach, scheduling, payment, and cost data are integrated into a single project management control system using the task definition provided by the Work Breakdown Structure (WBS) codes. This allows project costs to be matched to each task and to be tracked throughout the project. As noted in Table 3, several turnkey projects employ this form of schedule control, which appears to imply a higher level of informational and systems monitoring on the part of the owner, but a decreased investment in on-site agency staffing.

TABLE 3
Application of Cost-Loaded Schedule Method

Project	Procurement Method	Require Cost-Loaded Schedule
Baltimore CLRL Extensions	Modified Civil D/B	No
BART San Fran. Airport Extension	Modified Civil D/B	Yes
NJ Transit HBLRTS	Full DBOM	No
San Juan Tren Urbano	Modified DBOM	Yes
Baltimore CLRL Phase I	Conventional	No
BART Colma Station Project	Conventional	Yes

Documentation of application of the cost-loaded schedule method assists in determining how such a method may address issues particular to the turnkey method. A more thorough discussion of the cost loaded scheduling approach is found in Appendix C.

Project Observations

San Juan's schedule management system is based upon the cost-loaded method. The STTT contractor and the ASC contractors must submit cost-loaded schedules to a Level 4 degree of

detail as part of their proposals to the owner. The Level 4 detail represents the contract schedule and the contract budget. Once the contract is awarded, the contractors submit a more detailed schedule at a Level 6 degree of detail. This level of detail drives the progress payment and cost control functions. Note that contractors are contractually tied to costs submitted at the Level 4 detail, but flexibility is provided for contractors to make changes at the Level 4 detail.

The San Juan Tren Urbano contractors are responsible for maintaining their respective schedules, with a high level of informational review provided by the owner and the owner's consultants (i.e. the GMAEC). Contractors are required to submit monthly schedule updates to the owner, which are tied to the payment of the contractor. This relationship of combining payment and scheduling provides a consistent reporting framework for progress monitoring and reporting and an important incentive for the contractor to stay up-to-date on scheduling and progress reporting requirements. In addition, the detailed nature of the cost-loaded scheduling approach provides the owner with an effective tool to monitor specific progress of key tasks on the critical path without the necessary expense of extensive field staff.

BART relied on the cost-loaded schedule approach with the conventional BART Colma Station project and plans to implement a similar approach for the San Francisco Airport Extension project. Both projects required the contractors to submit and develop cost-loaded critical path method (CPM) schedules as part of their proposal effort, with additional refinement provided after contract award. In each case, the schedule served as the basis for cost and payment control. The Colma project relied upon the GEC and construction management consultant to provide primary review of the contractor's schedule. The BART management team for the Airport Extension, which includes GEC and subconsultant support, will similarly monitor the contractor's schedule. Each project requires monthly schedule updates to be submitted by the contractors.

The Baltimore CLRL Extensions turnkey contract indicated a reduced level of schedule control on the part of the owner and contractor. The owner is responsible for developing and maintaining a master summary schedule based on input from the contractor. The design-build contractor was required to submit a schedule with the proposal, but the schedule was not significantly detailed and did not follow the cost-loaded approach. The design-build contractor also was to develop a detailed schedule following the contract award in December 1994, but did finalize the schedule until the fall of 1995. The contract required monthly updates to schedule changes, but these were not followed closely by the contractor or the owner.

For example, the owner did not receive a schedule update from the contractor for several months until one was requested by the owner in early 1996; based on the expectation of a measurable critical path task delay. By the time an update was received, several elements on the critical path were behind schedule, which delayed the entire project from ahead of schedule to several months behind. Note that the owner only had one agency staff member originally assigned to the scheduling effort; a situation that changed quickly. The owner hired a consultant to develop the base project schedule and then manage the scheduling process and ongoing schedule maintenance in March 1996, due in part to some of the schedule shortfalls experienced by the contractor.

The level of schedule monitoring for the CLRL Extensions now follows that implemented for the CLRL Phase 1 project. The CLRL Phase 1 project required contractors to provide regular schedule updates, although a less formal method (not directly related to the payment mechanism and without clearly stated penalty and bonus clauses) of schedule monitoring was actually followed. The schedule was not cost-loaded and was not directly related to progress payments or cost control. The owner did have a higher level of in-house staff dedicated to schedule monitoring under the CLRL Phase 1 project, with two staff dedicated full-time to the effort.

Turnkey Implementation Issues

The turnkey projects examined require the contractor to assume a greater role in developing and maintaining the schedule than under conventional procurements. In order for this control to be implemented effectively, specific schedule management mechanisms need to be established through the contract. Contractor involvement in schedule development as part of the procurement and contract development process can increase the contractor's ownership and commitment in the schedule management functions.

The owner must maintain an active level of schedule control as well. It may seem that a higher level of schedule control by the contractor would lead to a lower level of schedule monitoring by the owner. However, the owner still is the ultimate participant impacted by delays to the schedule and has a vested interest in ensuring that the schedule is maintained properly. As indicated by the Baltimore CLRL Extensions project, schedule delays may be experienced if the owner does not maintain regular monitoring over the contractor's adherence to the schedule.

As noted in the *Review of Project Management Control Systems on Selected FTA Funded Projects*, "requiring cost loaded CPM schedules provides the increased ability to monitor the status of a particular contract. The larger the contract, the more useful the process, and the greater the benefits derived." [3] This is especially true for turnkey projects. The cost-loaded schedule provides specific definition to project requirements, which offers guidance to the contractor in fulfilling schedule management requirements. At the same time, detailed reporting requirements linked to cost provides the owner with information it needs to ensure that the project remains on schedule. The cost-loaded schedule method assists in retaining accountability of the contractor to the owner while pushing down responsibility for schedule management to the contractor.

Progress Payments

Progress payments ensure that the contractor is compensated for completed work but also have an inherent role in ensuring the project schedule is maintained and contracted product quality is attained. Generally occurring on a monthly basis, the payments provide a means for the owner to verify completion of work by the contractor. Of particular interest is the degree to which the payment process is linked to other project management requirements, such as schedule monitoring, and cost and quality control. The timetable for payments and process for inspecting the work are also indicative of the level of project control.

Project Observations

BART's Colma Station project and the San Francisco Airport Extension project base progress payments on the cost-loaded schedule developed by the contractors. For the San Francisco Airport Extension, BART authorizes the contractor and Resident Engineer to review the progress schedule against actual project progress and submit a related invoice. BART provides for payment twice a month, partly to ensure that subcontractors receive payments needed for project participation.

The San Juan Tren Urbano project also bases progress payments on the cost-loaded schedule system. San Juan's payment system provides for monthly payments based upon applications submitted by the STTT and ASC contractors. The application demonstrates the total value of work performed for each WBS activity completed within the payment period. This allows the progress payments to reflect actual product output since Resident Engineers must agree to each schedule and completed cost activity. Progress payments also ensure that schedule and cost functions remain up-to-date. Each application for payment is required to include a monthly progress report, an approved updated schedule of values, and a detailed CPM schedule reflecting project progress.

The NJ Transit HBLRTS payment system adapts to the innovative financing mechanisms included as part of the contract. The DBOM contract is a lump sum contract with a bid quarterly payment schedule. During contract initiation, the Project Director prepares an initial purchase requisition for the value of quarterly payments bid for which funding is available. As additional funds become available, the Project Director prepares subsequent purchase order requests for the additional value of the quarterly payments that can be funded with the additional funding. Payment is made based on the amount expended to date reported by the DBOM contractor and is not to exceed the quarterly payment provisions included in the bid documents.
The Baltimore CLRL Extensions follow a more traditional progress payment approach similar to that used for the CLRL Phase 1 project. Monthly payments are provided to the contractor. The design-build contractor develops payment estimates and schedule with the owner upon contract initiation. Payment occurs through contract invoices with the Resident Engineers, but is not related to the overall QA/QC functions.

Turnkey Implementation Issues

The progress payment and related inspection process provides the owner with a tool to maintain a direct, accountable relationship with the turnkey contractor. The contractor is reliant on the payment system and has a vested interest in complying with payment requirements. By incorporating schedule and cost reporting functions within the payment process, the owner can retain a higher level of control over other project management functions. The San Juan Tren Urbano project's requirement of combining payment applications with schedule and cost updates is an example of one of the benefits to this combined approach.

The progress payment timetable may be shortened to address special requirements of the turnkey environment. Owners still tend to follow monthly payment cycles, although deviations from this

trend are found to meet specific project needs. BART's adoption of the bi-monthly schedule payment allows the owner to address concerns from subcontractors regarding payment under the turnkey method. The innovative financing method (contractor cash flow financing contributions) employed by the NJ Transit HBLRTS project reflects adaptations to the progress payment schedule, with quarterly payments provided as noted above.

Application of the cost-loaded scheduling method to the progress payment process can assist in coordination of project management functions. Such an effort may require additional levels of planning effort by both the owner and contractor during initial stages of the project. However, a higher level of initial planning provides a basis for effective reporting by the contractor and monitoring by the owner once the project is underway. Cost-loaded schedules allow for a more automatic approval of progress payments and an overall streamlining of the progress payment system. These benefits are supportive of the overall turnkey goals of efficient project advancement and implementation.

Cost Control and Job Accounting System

Cost control supports the owner's objective of ensuring that the project remains within budget. This function is especially critical within the turnkey environment where project management requirements are passed along to the turnkey contractor. As with other project management systems, specific application of cost control varies depending upon the project.

Project Observations

BART's approach to cost control for both the Colma Station project and the San Francisco Airport Extension project is based upon the cost-loaded schedule method. In the Colma Station project, the Resident Engineer payment authorization package included cost data to update the Financial Management System, which tracks budget and costs by activity, resource type, and FTA-required categories. A unique aspect of the BART cost control system for the Airport Extension project includes an identifying coding structure for subcontractors. This assists in forecasting payment to subcontractors and following payment cycles.

The San Juan Tren Urbano project links cost control to the cost-loaded schedule. The contract budget is establishes vis-à-vis the cost-loaded summary schedule. Monthly updates at a more detailed level (Level 6 of detail) provide cost and cash management control for the owner since contractors must submit a revised schedule of values for each task. This level of detail appears appropriate for the San Juan project, and allows the owner to identify potential cash flow needs and/or substantial cost increases in advance of occurrence.

The NJ Transit HBLRTS appears to provide a high level of emphasis on cost control, perhaps due in part to the innovative financing approaches employed under the turnkey contract. The draft Project Management Plan provides a thorough degree of detail on the proposed cost control system, with specific requirements outlined for cost control of the DBOM contractor, the owner's consultants, and the owner agency. The DBOM contract requires that a budget be created for

each cost objective based on funding sources and be input into the Capital Project Accounting System. Any transfer between cost objectives must be requested by the Project Director and approved by the Manager of Grants and Control. This gives the owner a high level of management review to ensure that costs are allocated to appropriate funding sources.

Turnkey Implementation Issues

Effective cost control is a key component of project management, especially within the turnkey environment. One of the concerns under turnkey may be the degree to which an owner has authority over project expenditures given increased management roles provided to the turnkey contractor. Specific cost control methods can be adapted to meet requirements of the project. NJ Transit HBLRTS provides a specific focus on cost control through its contract documents and retains a high level of authority over cost changes and approvals. Of particular interest is the ability under BART's San Francisco Airport Extension to track payments to subcontractors through a unique coding structure. In addition to providing an added level of cost control, this management tool offers added benefits of ensuring subcontractor payment needs are met.

Technical and Scope (Configuration) Control

Technical and scope or configuration control consists of the evaluation and coordination of changes in project specifications and drawings. Specific definition of responsibility for configuration control requires attention in the turnkey environment since the turnkey contractor assumes added responsibility for design functions. Owners and contractors must define the division of responsibility and accountability for configuration control through the contracting process.

Project Observations

The BART San Francisco Airport Extensions project requires the design-build contractor to develop and implement a configuration control mechanism. The configuration control function is to be designed to provide coordination among the other contractors involved with the project. San Juan Tren Urbano also allows the STTT contractor (its turnkey contractor) to interact with other contractors. The STTT contractor has design review of ASCs in parallel to the owner review. While the STTT contractor does not define configuration control for the ASCs, it does act in an review function since the overall requirements of the STTT and ASC contracts are closely interrelated.

The Baltimore CLRL Extensions project also requires the contractor to develop and implement a configuration management plan and control procedures. The contract documents provide for an initial concept phase design review jointly by the owner and contractor. However no further review is required unless specified in the contract documents. This demonstrates a lower level of control provided by the owner, consistent with approaches to other CLRL Extensions project management functions.

Turnkey Implementation Issues

The turnkey projects reviewed all provide the turnkey contractor with responsibility for configuration control. The owner retains some monitoring functions through inspections and audits, although at a slightly lower level of detail and frequency than experienced under a conventional contract. Note that when a turnkey contract is closely related to other contracts within the project, a degree of review authority by the turnkey contractor may be appropriate. This approach may follow the model presented by the San Juan Tren Urbano project, where the STTT contractor is provided parallel design review for the ASCs in conjunction with the owner.

Change Orders and Claims Management

The process for change order/claims management involves initiation of the change order or claim, processing the change order or claim, and providing documentation and resolution to the matter. Owners typically devote internal or GMC/GEC resources to change order/claims management under conventional procurements. Projects examined in this analysis provide examples of the roles owners and contractors assume in the change order/claim administration process under the turnkey procurement method.

Project Observations

The Baltimore CLRL Extensions and the CLRL Phase 1 projects demonstrate similarities in the change order/claims administration process. Both projects rely upon a Change Order/Claims Review Board, which is established by the owner for the respective project and meets quarterly to monitor ongoing activities of staff. Resident Engineers review and recommend actions on change orders, and have authority to direct changes limited to bringing the project into compliance with contract documents. Staff Engineers finalize all change orders and recommend action on claims.

Resident Engineers also were responsible for the administration of change orders in the BART Colma Station project. The owner's construction management consultants negotiated change orders with contractors and made recommendations to the GEC on the value of changes and the schedule impact. BART plans to alter this approach somewhat for the San Francisco Airport Extensions project. The owner expects that the majority of change orders will be handled internally by the design-build contractor.

The NJ Transit HBLRTS project provides for change order/claim administration to be handled at a higher level of responsibility within the owner agency. Each change order request is to be reviewed by the Project Director with recommendations forwarded to the Contracting Officer for approval or denial. Any disputes with the DBOM Contractor are to be handled through the authorized representative of the Contracting Officer.

Turnkey Implementation Issues

It appears that few refinements to the actual change order/claims process are required under the turnkey method as some owners are following similar procedures as employed under conventional. It is hypothesized that turnkey will result in a reduced number of change orders/claims, but in higher cost per change order or claim. While projects are not far enough advanced to evaluate fully this comparison, the hypothesis has some impacts on the approach to project management. Owners may find that a lower level of administrative attention needs to be provided in managing the number of change orders/claims. However, a higher level of attention may be required to assess the specific requirements of each change order/claim as they increase in size and complexity. This attention to change order/claim detail may offset any savings resulting from a reduction in the overall number of claims.

The degree to which project staff are provided the authority to negotiate directly with the contractor can impact the overall timeliness of the change order/claims administration process. Turnkey may require some adjustments to change order/claims threshold review levels. Since the overall scope and size of the turnkey contract is larger, the dollar amount of change orders/claims may be higher. However, as a percentage of total contract cost, the percentage may be in line with that experienced under a conventional contract. Turnkey contracts may require that the owner raise the threshold amounts requiring senior staff approval so that project staff have necessary authority to advance the project and make decisions at the appropriate organizational level.

Quality Assurance/Quality Control Program

Quality Assurance and Quality Control (QA/QC) represents all the activities required to verify, audit, and evaluate quality in a project. Activities associated with this function assist owners and contractors in preventing errors from occurring and finding errors quickly after they have occurred. Components of a QA/QC program may include the inspection and testing program, quality audits, and actions to correct findings. This section explores how responsibility for QA/QC is adapted under the turnkey process.

Project Observations

The turnkey projects provide the turnkey contractors with added responsibility for program implementation. The BART San Francisco Airport Extension plans to transfer additional QA/QC functions to the design-build contractor. However, the owner will conduct quality surveillance to ensure incorporation of design intent into the construction process.

The San Juan Tren Urbano project provides QA/QC responsibilities to the STTT and ASC contractors while retaining a high level of control for owner monitoring. The STTT contractor is to submit a QA/QC program plan to the owner for approval. This plan is to be reviewed and updated on regular basis, and not less than semi-annually. Note that the STTT and ASC contractors are each responsible for the quality of their respective work, but do not have direct

supervision for one another's work. The owner has the authority to audit and inspect contractor quality programs at any time.

The Baltimore CLRL Extensions project provides the design-build contractor with responsibility for QA/QC requirements, including audits and inspections of all materials and facilities not supplied by the owner. The owner originally planned to provide a minimal effort of monitoring, while retaining the option to provide inspection deemed necessary to ensure implementation of the contractors QA/QC program and thereby assure the quality of the design-build contractor's work. This type of QA/QC function implementation was new to both the owner and the contractor. The owner permitted the bidders to certify that they would follow the owner's QA/QC plan instead of developing their own during the procurement process. This may have had an unintended result of allowing decreased consideration of the QA/QC plan during the procurement process. The CLRL Extensions project demonstrated initial confusion over roles and responsibilities between the owner and the contractor, especially in regard to the contractor's unfamiliarity with construction management functions. Additional effort was required by the owner to get the contractor to implement the defined program once the project was underway.

Turnkey Implementation Issues

The shifting of responsibility for QA/QC under the turnkey method requires clear definition of roles for both the owner and contractor. The owner and contractor must carefully define the QA/QC program—including roles and responsibilities—within the bid documents so that participants are clear as to their requirements As with other areas of project management control, it is helpful for owners to monitor the QA/QC program. The owner may have to provide additional monitoring than would be anticipated in the turnkey contract to ensure that the contractor has a full understanding of requirements for quality management and corrective actions.

Owner Monitoring/Contractor Reporting

This project management control function includes formal requirements of contractor reporting, such as a timetable for report submittal and contents thereof. It also addresses monitoring functions that occur through informal monitoring provided by the owner during ongoing meetings and visits with contractor staff. Owner monitoring and contractor reporting are closely related to schedule management, progress payments and cost control functions.

Project Observations

The BART San Francisco Airport Extensions project decreases the level of monitoring provided by the owner and GEC by assigning significant responsibility to the design-build contractor. The contractor is still required to submit regular status reports through the bi-monthly cost-loaded schedule updates and progress payment cycles. This represents increased reporting requirements than followed under the BART Colma Station project. In the latter project, the owner prepared

monthly project status reports based on detailed Resident Engineer authorization packages and other submittals.

The San Juan Tren Urbano project retains almost all responsibility for project monitoring with the owner. As the contracting authority for the STTT contract and ASC contracts, the owner requires monthly submittals of detailed status reports by the contractors. The STTT contractor may interface with the ASC contractors for project coordination issues. But the STTT contractor does not have direct monitoring responsibility of the ASC. contractors. The owner plans to initiate a partnering process to facilitate more informal reporting and communication among project participants.

The Baltimore CLRL Extensions provides regular reporting requirements as part of the contract documentation. The design-build contractor and owner attend bi-weekly progress review meetings to discuss the status of project. In addition, the contractor is required to submit monthly progress reports to the owner. The project also implemented a partnering process, developed at the request of the contractor, which provides encouragement for ongoing, informal reporting by the entities.

Turnkey Implementation Issues

The receipt of timely and accurate report updates is critical to providing thorough project management for the turnkey contract. Given the responsibility provided to the turnkey contractor, it is especially critical that any project implementation problems be identified promptly so that they do not have multiple impacts on the project. Informal and formal regular reporting, such as monthly status reports or weekly meetings, are important to owner monitoring. However, this information is of lessened value unless a thorough review and response is provided by the owner. Turnkey does not imply decreased reporting requirements by contractors to the owner. Instead, the complexities of the turnkey contract actually may require additional levels of reporting or detail on part of the contractor and a more thorough review by the owner.

Subcontractor and Disadvantaged Business Enterprise (DBE) Management

Subcontractor and DBE management generally remains the responsibility of the respective contractor under conventional and turnkey projects. This portion of the paper examines project management functions that can assist in assuring subcontractors and DBEs are completing project requirements and are compensated for their efforts.

Project Observations

The BART San Francisco Airport Extension project incorporates several processes in its project management structure to accommodate subcontractors and DBEs. Much of this control is based on the cost-loaded schedule approach advocated by San Juan Tren Urbano and BART. At BART, the WBS used to structure the schedule and cost control features of the contract includes

discreet identification of work for which DBEs are designated. The contract also contains a schedule outlining the cost and time-frame for DBEs and will be used to monitor DBE participation. DBE contractors will know when the prime contractor is paid for work that includes the DBE work through DBE compliance staff on the contractor's team.

The San Juan Tren Urbano project includes similar methods to ensure proper payment of subcontractors and DBEs. The STTT contractor and ASC contractors are required to provide monthly DBE reports to the owner. In addition, subcontractors and DBEs are required to be paid upon receipt of payment from the owner out of the amount paid to the respective turnkey contractor. The Baltimore CLRL Extensions also require monthly reports by the design-build contractor to advise of DBE utilization. Payments to subcontractors are contingent upon owner payment to the design-build contractor.

The NJ Transit HBLRTS project includes a provision to ensure that subcontractors payment needs are met in light of the innovative financing arrangement developed in the DBOM contract. The DBOM contractor is required to submit a subcontracting and DBE plan as part of its proposal and to update the plan on a quarterly basis to demonstrate compliance with requirements. While the update is only required on a quarterly basis (as is the progress payment method), the DBOM contractor is required to pay the first tier DBE subcontractors all of the invoiced amounts (less retainer) within 30 days of delivery of an invoice by each subcontractor.

Turnkey Implementation Issues

Additional subcontractor and DBE management is required by contractors under turnkey. The owner may wish to include mechanisms in the contract development process to provide guidance to the turnkey contractor's management of the subcontractors and DBEs and ensure their payment. This may require modifications to standard project control systems, such as the identification of DBE activities in the WBS as demonstrated in the BART project or payment accommodations to subcontractors as reflected in the NJ Transit project. Adding specific payment timeframes can also assist in meeting concerns of subcontractors.

Escrowed Bid Documentation

Escrowed bid documentation (EBD) requires contractors and subcontractors meeting certain thresholds to place documents used to prepare bid offers in "escrow" for possible review during the contract period. Specific requirements of EBD are defined in the project contract, including who may have access to the documents and when that access may occur. This innovative project management method has had limited use in public works contracting, especially in the transit community.

Project Observations

BART is implementing EBD as part of its San Francisco Airport Extension project. The EBD will be consulted to facilitate resolution of issues raised by any project member, and may be reviewed by the project Disputes Review Board if approved by both parties involved in the dispute. The NJ Transit HBLRTS project also provides EBD available for joint review by the DBOM contractor and owner in connection with any dispute resolution process, but offers the owner the right to review the documentation following filing of a claim. NJ Transit also includes provisions whereby each subcontractor whose price equals or exceeds $10 million must submit EBD to the DBOM contractor. A similar approach is seen with the San Juan Tren Urbano project, where separate EBD proposal documents are required for each subcontractor whose total subcontract price exceeds two percent of the contract price.

Turnkey Implementation Issues

EBD is included in the contract documents for several of the turnkey projects, but complete observations from implementation as an Alternative Dispute Resolution tool are not yet available. Given the size of the turnkey contracts, it is important to consider that the subcontract may represent a sizable cost to the turnkey contractor and owner. As such, it may be appropriate to extend EBD requirements to the subcontractors as reflected by the NJ Transit and San Juan projects above.

Verification/Close-out and Project Delivery

This project management control function includes all activities associated with final acceptance testing and delivery of the project from the contractor to the owner. The division of roles may indicate a shared approach between the owner and contractor for this project depending on the nature of the contract.

Project Observations

The Baltimore CLRL Extensions project provides authority with the Resident Engineers for conducting final inspections. The design-build contractor provides initial testing, with approval and witness of the owner. In addition, the final integration of the completed system is shared by the owner and the design-build contractor.

The BART San Francisco Airport Extension project provides the design-build contractor with primary construction inspection responsibility. The owner offers verification and oversight through inspectors assigned to the Resident Engineers, but plans to assume a lower level of this responsibility. The design-build contractor will integrate systems work with other civil work conducted, complete integration testing and support the owner on other operational acceptance activities.

The NJ Transit HBLRTS project provides for the DBOM Contractor to perform inspection and testing according to the approved QA/QC plans. Given that the DBOM Contractor will assume operations and maintenance of the system following completion, the contractor has primary responsibility to coordinate performance of the system with other contractors. The contract documents provide for the owner to play a role in overall project acceptance, including system performance demonstrations.

The San Juan Tren Urbano project has similar issues to consider in balancing interests of the owner and the STTT contractor, who will provide initial operations for the system. The contract documents provide that the owner and owner's representative make final inspection of all work with the STTT and ASC contractors. However, the STTT contractor may join them in the inspection and review of the ASC contractor work to ensure compliance with overall requirements.

Turnkey Implementation Issues

The actual implementation of planned control measures for project close-out and delivery has not been observed in the turnkey projects. However, several comments can be offered regarding planned changes made to this process. Under the DBOM approach, the close-out and delivery requirements must consider both contractor's interest in short-term operations and the owner's interest in long-term system quality. The San Juan approach of providing ultimate responsibility for close-out and delivery, including inspections, with the owner while allowing a degree of review by the contractor appears to be an effective compromise to addressing the needs of both project participants.

FTA RULES AND GUIDELINES

The FTA's dedication to the turnkey process is reflected by concern over identifying ways in which existing Federal rules and guidelines can be adapted to further accommodate the turnkey process. FTA guidelines for procurement and project administration requirements are governed by 49 CFR Part 18, the Common Rule, "Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments." The FTA has developed additional documents to provide guidance on the Common Grant regulations within the transit environment industry.

In recent years, the FTA has provided owners with authority necessary to implement effective project management control practices based on its philosophy to "not substitute its judgment for that of the grantee or subgrantee unless the matter is primarily of Federal concern."[4] Revisions to FTA's *Third Party Contracting Requirements* (FTA Circular 4220.1D), *Grant Management Guidelines* (FTA Circular 5010.1B) and *Project and Construction Management Guidelines* have eased the procurement and project administration requirements for grantees, with benefits for both turnkey and conventional projects. Observations regarding the impact of these and other refinements on the turnkey process and a discussion of additional refinements that can be considered in the future are noted below.

Third Party Contracting Guidelines (FTA Circular 4220.1D)

- FTA's removal of progress payment restrictions in the revised FTA Circular 4220.1D provides greater latitude for turnkey procurements.

- Payment methods such as those included in the financing strategy of the NJ Transit HBLRTS require coordination with FTA and may indicate additional review required for progress payment reporting mechanisms.

- Although outside the direct scope of this paper, Federal bonding requirements outlined in this circular should be examined to ensure that they are appropriate in consideration of the size and scope of turnkey contracts.

Grant Management Guidelines (FTA Circular 5010.1B)

- FTA guidelines for claims and change order processes, including requirement of notification if the settlement exceeds $100,000, appear to be appropriate given turnkey experiences to date.

- The FTA value engineering requirements may need to be modified to account for the inherent value engineering incentives already reflected in the combined design-build functions within the turnkey contracting structure.

- Further research into existing lease and equipment management guidelines may identify issues regarding satisfactory continuing control and monitoring of FTA-funded assets, such as vehicles, under DBOM contracts during the operations period.

Project and Construction Management Guidelines and Other Issues

- FTA's *Project and Construction Management Guidelines* presents a through consideration of methods for implementing effective project management control and the recent update to consider turnkey and design-build approaches enhances its application for turnkey.

- The FTA Project Management Plan requirements may require some revision to emphasize turnkey issues of contractor roles in project management, with attention to schedule monitoring and implementation of QA/QC programs.

- The timing for the full funding grant agreement has historically occurred after final design for traditionally contracted projects, but must be moved forward in the process to follow preliminary design so that Federal funding commitment can be reflected in the turnkey project procurement process and attract the widest contractor competition.

- The FTA may wish to consider developing guidelines to assist owners in providing the appropriate level of management during the operations phase of DBOM contracts. Specifically, FTA guidance could assist in ensuring that processes are in place for turnkey contractors to meet all Federal guidelines for transit system operations, including Urbanized Area Formula Funding requirements such as the FTA Drug and Alcohol program, procurement polices and other grantee requirements mentioned above.

It is hoped that discussion of the lessons learned identified through this research will identify additional methods through which the FTA can facilitate more effective project management control in turnkey projects. Further documentation regarding practical Federal issues grantees and contractors are experiencing in regard to project management control will be identified as projects proceed into the construction stage and through reactions to this paper.

PROJECT MANAGEMENT CONTROL AND RISK MANAGEMENT

The turnkey method implies that the owner will shift a certain portion of risk and responsibility among the various project development participants, but mainly to the contractor. The process of shifting risk from the owner agency to the contractor, referred to as the risk identification and risk allocation functions, is beyond the scope of this paper. Instead, this section considers the relationship of risk management and implementation of the risk management plan to the various project management control functions. It examines how project management control systems are used to support the risk management plan and implementation process.

The development of the risk management program influences definition of project management control responsibilities. The risk allocation process identifies specific risks that may be faced during the course of the project and determines the most effective manner in which to allocate them. This process determines whether the risk is assumed by the owner, assumed by the contractor, or shared between the two. Allocating the risk will influence overall project management requirements that relate to risk management. For example, if an owner decides that schedule risk will be shared between the owner and contractor, project management functions related to scheduling must provide a level of control to both the owner and contractor and manage this jointly shared responsibility function. If it is decided that the contractor will assume responsibility for design and integration risk, then the contractor may need to be provided with more authority for configuration control and QA/QC project management functions and the owner agency provided with ongoing monitoring functions.

Once the project is underway, project management control systems assist in maintaining the risk management program. Cost control functions may provide a means for the owner and agency to monitor financial risk, especially if innovative financing mechanisms are followed as exemplified in the NJ Transit HBLRTS project. The QA/QC program can assist in managing risk to both the owner and contractor associated with construction performance. Management control systems may also assist in identifying additional risks as the project proceeds and in managing the risks as they are identified. For example, the configuration control process could identify additional underground utility relocations that are required and, if not identified, could have impacted project development. These examples demonstrate the key roles that project management control functions and the various supporting systems elements support the implementation of the risk management plan.

LESSONS LEARNED SUMMARY

There are no prescriptive rules for establishing effective project management control within the turnkey environment. Each approach must be adapted to fit the specific project definition and account for the owner's culture, in-house skill base and historical experience. However, there are certain challenges presented by the nature of turnkey contracts that consistently impact turnkey projects. Methods owners have employed to address these challenges have been discussed throughout the paper, and the following section provides a summary of these lessons learned for possible future application to other projects.

Lessons Learned: Turnkey Organization

Turnkey projects demonstrate an overall increased responsibility for project management on the part of the contractor. At the same time, the projects indicate that owners retain a high level of authority as well for project monitoring. This shared responsibility for project management provides several lessons regarding organizational roles in turnkey project management.

Owner Issues

- The level of management control for a project is influenced by the nature of the turnkey project, the size and scope of the project, the right-of-way location, and whether the project is a new start or extension.

- An owner's approach to project management control in previous conventional projects will serve as the basis for control in the turnkey project.

- The type of turnkey contract influences the level of project management control required by the owner, with more complex DBOM contracts demonstrating a high level of informational reporting control by the owner and usually less direct staff monitoring of the contractor.

- An owner's culture can foster innovation through turnkey while encouraging high levels of project management control since both approaches support a similar goal of advancing the project as quickly and cost-effectively as possible.

- Decreases in owner staff and resources devoted to project management under the turnkey method may be somewhat offset by increased responsibility for project management provided to owner management consultants and the turnkey contractor.

- The level of trust created through partnering may encourage a degree of informality that could decrease project accountability and reporting requirements and lead to omission of key management requirements by both contractor and owner.

Contractor Issues

- The turnkey contractor must be able to take a broad approach to project control and manage project functions not normally of concern under a conventional project.

- Development of project management roles and responsibilities should receive significant attention during the procurement process, with the contract providing clear definition of owner and contractor roles.

- The turnkey contractor may require additional guidance from the owner agency in the initial stages of the project to ensure conformance with detailed reporting requirements and to outline expectations for contractor's role in management control.

Lessons Learned: Turnkey Implementation

Adaptations to project management control systems may be required in order to meet the unique requirements of the turnkey environment. Specific observations from turnkey projects currently underway are presented below. Additional lessons learned will likely be presented as the projects advance through the construction phase.

- Contractors assume some added responsibility for schedule management and cost control under turnkey, but owners tend to retain a high level of control over these functions as compared to other project management functions.

- Combining schedule management, progress payments, and cost control through the cost-loaded schedule process as adopted by San Juan Tren Urbano and BART San Francisco Airport Extension projects can provide owners with a higher level of project monitoring while streamlining the overall project management process.

- Although most agencies rely on monthly progress payments, in some cases it may be necessary to shorten the payment timetable to accommodate concerns from local subcontractors regarding payment. BART's use of bi-monthly payments for the San Francisco Airport Extension was implemented in part to address this concern.

- The owner and contractor must carefully define the QA/QC program, including roles and responsibilities within the bid documents, so that participants are clear as to requirements and the owner role is clearly focused to provide program management.

- Turnkey contractors should have some review authority for the other contractors when the contracts are closely related. This process may follow the review model presented by the San Juan Tren Urbano project, where the STTT contractor is provided parallel design review for the ASCs in conjunction with the owner.

- Turnkey contracts may require that the owner raise the threshold amounts for change orders/claims requiring senior staff approval so that project staff have necessary authority to advance the project and make decisions at the appropriate organizational level.

- The complexities of the turnkey contract actually may require additional levels of reporting or detail on part of the contractor and a more thorough review by the owner.

- Owners should be sensitive to subcontractor and DBE needs when structuring project control systems and may need to include mechanisms within the turnkey contract to provide review of the turnkey contractor's management of subcontractors and DBEs.

- Given the size and scope of the turnkey contracts, it may be appropriate to extend EBD requirements to the subcontractors as reflected in the NJ Transit HBLRTS and the San Juan Tren Urbano projects.

- DBOM contracts should consider both contractor's interest in short-term operations and the owner's interest in long-term system quality when structuring the close-out and delivery requirements.

These and other additional subject area lessons learned from the Turnkey Demonstration Program will be submitted to Congress through ongoing status reports over the upcoming years.

REFERENCES

1. Karla H. Karash and Thomas J. Luglio, Jr., *Project and Construction Management Guidelines: 1996 Update*, EG&G Dynatrend, Wellesley, MA, June 1996, p. 3-2.

2. Karla H. Karash and Thomas J. Luglio, Jr., *Project and Construction Management Guidelines: 1996 Update*, EG&G Dynatrend, Wellesley, MA, June 1996, p. 3-2.

3. *Review of Project Management Control Systems on Selected FTA Funded Projects*, Hill International, Willingboro, NJ., June 1994, p. 146.

4. *Grant Management Guidelines*, FTA Circular 5010.1B, September 7, 1995.

APPENDIX A

TURNKEY AND CONVENTIONAL

PROJECT MANAGEMENT CONTROL DOCUMENTATION

BALTIMORE CENTRAL LIGHT RAIL LINE EXTENSIONS (PHASE II)

Project Management Role: Owner with supplemental consultant support

Schedule Management and Control

- Owner develops and maintains Level I project master summary schedule
- Design-build contractor not required to submit significantly detailed schedule with proposal
- Design-build contractor developed detailed schedules (not cost-loaded) after contract awarded
- Only one owner staff member originally monitoring schedule; owner hired consultant to oversee scheduling in March 1996
- Contract requires monthly updates to schedule changes, but not closely followed by owner

Progress Payments

- Monthly payment system based on lump sum job method with no unit prices
- Design-build contractor developed payment estimates and schedule with owner
- Payment through contract invoices from Resident Engineers, but not related to QA/QC functions

Cost Control and Job Accounting Systems

- Design-build contractor provides staff to monitor, control and report design and construction costs
- Project Financial Plan developed by owner, including budgets for all costs

Technical and Scope (Configuration) Control

- Design-build contractor required to develop and implement a configuration management plan and configuration control procedures
- Initial concept phase design review with owner and design-build contractor provided, but no further formal design reviews by owner required unless identified in specifications

Change Orders and Claims

- Change Order/Claims Review Board established by owner for project and meets quarterly to monitor ongoing activities of project staff
- Resident Engineers recommend actions on Change Orders; authority to direct changes limited to those that bring project into compliance with contract documents

- Staff Engineers finalize all Change Orders and recommend actions on claims

Quality Assurance/Quality Control

- QA/QC new to both owner and design-build contractor
- Significant amount of control and quality responsibility passed along to contractor from owner
- Bidders permitted to provide certification they would follow owner QA/QC plan instead of their own instead of developing plan in proposal process.
- Design-build contractor responsible for QA/QC requirements, including audits and inspection of all materials and facilities not supplied by the owner
- Owner can provide inspection it deems needed to assure quality of design-build contractor's work

Owner Monitoring/Contractor Reporting

- Bi-weekly progress review meetings held between owner and design-build contractor
- Design-build contractor required to submit monthly progress reports to owner
- Resident Engineers recommend actions on Change Orders, schedule modifications, progress payments, and keep daily logs
- Partnering process developed at request of contractor

Subcontractor and DBE Management

- Owner requires monthly reports by contractor on DBE utilization
- Payments to subcontractors contingent on owner payment to design-build contractor

Verification/Close-Out and Project Delivery

- Respective Resident Engineer conducts final inspections for each CLRL extension
- Design-build contractor conducts test, with approval and witness by owner
- Testing and integration of completed system shared by owner and design-build contractor

BART San Francisco Airport Extension

Project Management Role: Owner Team (GEC and specialty subconsultants) primary role of construction management
Design-build contractor assigns professional engineering firm to perform construction management

Schedule Management and Control

- Cost-loaded Critical Path Method (CPM) schedule required to be submitted by design-build contractor
- Design-build contractor must submit schedule updates at defined intervals as noted in contract
- Schedule drives payment and cost control

Progress Payments

- Based on cost-loaded schedule developed through lump sum price bid items
- Contractor and Resident Engineer review progress schedule against actual progress and submit related invoice
- No measurement and payment provisions since not using unit price conventional method
- Payment to contractor and subcontractors twice a month

Cost Control and Job Accounting Systems

- Schedule cost-loading and cash flow tabulation updated at defined intervals as noted in contract
- Coding structure in specifications identify each subcontractor working on project and payment to respective contractors to be forecasted

Technical and Scope (Configuration) Control

- Design-build contractor required to develop and implement a configuration control mechanism to provide coordination among players

Change Orders and Claims

- Majority of changes/clarification expected to be handled internally by design-build contractor
- Resident Engineer will handle changes/clarifications to owner criteria

Quality Assurance/Quality Control

- Owner plans to transfer more responsibility and activities to design-build contractor
- Owner team to provide limited QA/review surveillance
- Expanded QA Program will be required of design-build contractor
- Owner will conduct quality surveillance review to ensure incorporation of design intent into construction process

Owner Monitoring/Contractor Reporting

- Minimized overall role owner team in managing interface between procurement and construction contracts by assigning significant responsibility to design-build contractor
- Owner plans to require design submittals, construction phase submittals, and close-out submittals, but only those needed to ensure compliance with contract requirements
- Resident Engineer plays limited role in coordination, but maintains payroll records and monitors contractor's performance
- Monthly report by design-build contractor required with monthly payment submittal to discuss progress, projected schedule milestones, contract operational issues, subcontractor coordination, DBE attainment, and other management issues

Subcontractor and DBE Management

- Work Breakdown Structure (WBS) includes separate identification of DBE designated work
- Coding structure records actual payments for subcontractor work to prime contractor
- Cost-loaded schedule ensure proper payment received for mobilization costs
- DBE subcontractors will know when prime contractor paid for work including DBE's work through DBE compliance staff on contractor's team
- Contract to include schedule outlining costs and time-frame for DBEs and will be used to monitor DBE participation

Escrowed Bid Documentation

- Project is owner's first extension to require Escrowed Bid Documentation (EBD)
- Will consult EBD to facilitate resolution of issues raised project member
- EBD may be examined by Disputes Review Board if approved by both members

Verification/Close-Out and Project Delivery

- Design-build contractor is responsible for primary construction inspection
- Owner provides verification and QA review through inspectors assigned to Resident Engineers, but lower level of effort than conventional

- Certain submittals may go to design-build contractor's engineer or architect for review and approval
- Single point responsibility to integrate systems and manage final testing/acceptance
- Design-build contractor to integrate systems work with other work, including integrated testing and supporting owner on other operational acceptance activities

NJ Transit Hudson-Bergen Light Rail Transit System

Project Management Role: Owner Agency
Selected PMAC (i.e. GEC), GDC, and consultant assistance

Schedule Management and Control

- Team approach with schedule reviewed and updated jointly by DBOM contractor and owner
- DBOM contractor will develop baseline CPM project schedule and propose WBS
- DBOM contractor will provide monthly updates to schedule and report narrative

Progress Payments

- DBOM contract lump sum with a bid quarterly payment schedule
- Project Director will prepare initial purchase requisition for value of quarterly payments bid for which funding is available as part of contract initiation
- As additional funds become available, Project Director will prepare subsequent purchase order requests for additional value of quarterly payments that can be funded within cumulative funding
- Payment will be made based on expended to date reported by DBOM contractor and not to exceed quarterly payment provided in bid documents

Cost Control and Job Accounting Systems

- Budgets created for each cost objective (based on funding sources) and input into Capital Project Accounting System (CPAS) for DBOM contract
- Transfers between cost objectives require Project Director to request changes be made by owner Manager of Grants and Control for DBOM contract
- Owner implements cost control of consultants by analyzing budgeted versus actual expenditures for labor, materials, and equipment on four-week project status reports
- Owner internal cost monitored through preparation of monthly financial report by departments
- Additional cost control measures to be implemented for railroad and utility work using CPAS

Technical and Scope (Configuration) Control

- Preliminary design and engineering activities/management handled by GDC
- Review of DBOM design activities provided by owner, GDC, PMAC and other consultants

Change Orders and Claims

- Change Orders to be represented in project schedule during schedule update meetings
- Change Orders to be monitored in project budget as approved, pending, or potential
- Change Order request reviewed by Project Director with recommendations forwarded to Contracting Officer for approval or denial
- Project Director coordinates disputes among participating agencies through respective project managers
- Disputes by DBOM contractor to be decided by authorized representative of Contracting Officer

Quality Assurance/Quality Control

- Owner developed initial Quality Assurance Program Plan specifically for project
- DBOM contractor to develop mandatory QA/QC plan which must be reviewed/approved by owner
- Owner to provide comprehensive audits and detailed review and review of DBOMs QA/QC plan

Owner Monitoring/Contractor Reporting

- Primary responsibility for construction review management will rest with DBOM contractor and will be based on the QA/QC Program
- Owner will provide overview of construction activities and quality through QA/QC program review

Subcontractor and DBE Management

- DBOM contractor submitted Subcontracting/DBE plan as part of its proposal
- DBOM contractor required to update Subcontracting/DBE plan on a quarterly basis to demonstrate compliance with requirements
- DBOM contractor to pay first tier DBE subcontractor all invoiced amounts (less retainer) within 30 days of delivery of an invoice by each subcontractor

Escrowed Bid Documentation

- EBD available for joint review by DBOM contractor and owner in connection with any dispute resolution proceeding
- Owner may review EBD any time following filing of a claim
- Each subcontractor whose price equals or exceeds $10 million must submit EBD to DBOM contractor

Verification/Close-Out and Project Delivery

- DBOM contractor will perform inspection/testing according to mandatory documents and DBOM contractor's approved QA/QC plans
- DBOM contractor to coordinate performance of work with other contractors (i.e. fare collection, etc.)
- Owner Project Manager conducts system performance demonstration

San Juan Tren Urbano

Project Management Role:

Owner some degree of management control
Owner's representative (GMAEC) primary management role
STTT contractor some responsibility

Schedule Management and Control

- Owner maintains overall schedule monitoring through owner's representative, but STTT contractor must work with interface of other alignment section contractors (ASC)
- STTT contractor and ASCs submit cost-loaded schedule to Level 4 detail as part of proposal
- STTT contractor and ASCs submit more detailed (Level 6) cost-loaded schedule after contract award
- Monthly schedule updates tied to payment must be submitted by STTT contractor and ASCs

Progress Payments

- Driven by cost-loaded schedule (Level 6 detail) submitted by STTT contractor and ASCs
- Monthly application for payment shows total value of work performed for each individual work activity completed during the monthly payment period
- Application for payment related to schedule/cost management and required to include a monthly progress report, an approved updated schedule of values, and detailed CPM schedule
- Progress payments relate to product output since Resident Engineers must agree to each proposed schedule and cost activity and assume responsibility of recommendation for acceptance

Cost Control and Job Accounting Systems

- Cost management occurs through the cost-loaded schedule initial submittal and regular updates
- Contract budget established via price proposal form and cost-loaded summary schedule (Level 4 detail) and represents the level where contract is proposed, negotiated, and awarded
- Selected STTT contractor and ASCs contractually tied to costs submitted at Level 4 detail (contract budget), but flexibility is provided to adjust costs and resources at the Level 6 detail
- Monthly updates provide cost control since contractors submit updated schedule of values for each task in revised schedule

Technical and Scope (Configuration) Control

- STTT contractor has design review of ASCs in parallel to owner review
- Owner still retains authority to review and approve final documents
- Owner and owner's representative may inspect and audit work at all stages

Change Orders and Claims

- Owner to implement claims management procedures
- Owner retains control over Change Order/Claims process with management provided by owner's representative
- Owner's representative and contracting officer review contractor change requests and approve/reject Change Orders
- Dispute Review Board formed for each STTT/ASC contract to handles claims/disputes

Quality Assurance/Quality Control

- Various levels of owner and owner's representative organizations responsible for supervision of QA functions during design-build phase
- STTT contractor to submit QA/QC program plan for owner's approval
- STTT contractor and ASCs responsible control quality of all their respective work, including that of their respective subcontractors
- Owner/owner's representative may audit/inspect contractors' and subcontractors' quality programs at any time
- QA/QC plan reviewed and documented not less than on semi-annual basis by contractors

Owner Monitoring/Contractor Reporting

- Owner contracting authority for STTT contract and the ASC contracts
- STTT contractor management responsibility for overall direction and control of work for STTT contract and interfacing with ASC contracts, but little direct management of ASCs
- STTT contractor provided right to review and comment upon design and construction activities performed by alignment section contractors
- Parties in project to participate in partnering process

Subcontractor and DBE Management

- STTT contractor and ASCs required to provide monthly DBE reports to owner
- STTT contractor and ASCs required to pay subcontractors upon receipt of payment from owner out of amount paid to contractor

Escrowed Bid Documentation

- Escrowed proposal documents used as reference source in negotiation of price adjustments and Change Orders and in settlement of disputes or claims
- Separate escrowed proposal docuemtns required for each subcontractor whose total subcontract price exceeds two percent of total contract price.

Verification/Close-Out and Project Delivery

- Owner monitors review of performance of contractors' quality program and observes inspection and testin activities
- Owner Contracting Officer and owner's representative make final inspection of all work iwth STTT or ASC
- STTT contractor joins owner and owner's representative in inspection and review of ASC work

Baltimore Central Light Rail Line (Phase I)

Project Management Role: Owner
Consultants provide construction management

Schedule Management and Control

- More informal method of schedule monitoring
- Schedule management handled in-house with two staff
- Contractors to provide regular updates, but not completely adhered to requirements
- Schedules not cost-loaded and not related to progress payments or cost control

Progress Payments

- Lump sum job method with no unit prices
- Payment through contract invoices from Resident Engineers based on extensive documentation

Cost Control and Job Accounting Systems

- Not related to schedule management or cost-loaded schedule

Change Orders and Claims

- Change Order/Claims Review Board established by owner for project and meets quarterly and establish change/claim policy and monitor ongoing activities of project staff

Quality Assurance/Quality Control

- Audits conducted by direct owner staff as Resident Engineers

Owner Monitoring/Contractor Reporting

- Owner primary role of management, but employed special consultants as needed for project and technical assistance

Verification/Close-Out and Project Delivery

- Responsibility of the owner for interface and overall coordination

BART Colma Station Project

Project Management Role: Owner primary role of project management GEC and construction management consultant, reporting to GEC, provide interface with contractors

Schedule Management and Control

- Contractors submit cost-loaded schedule used for schedule control and contains major activities to complete contract and amount to be paid upon completion
- Contractors submit monthly schedule reports to Resident Engineers
- Construction management consultant primary responsibility for schedule control, subject to review by GEC, who has overall coordination responsibility

Progress Payments

- Cost-loaded CPM schedule forms the basis for all payments to contractors
- Contractor submits monthly progress payment report to Resident Engineers
- Resident Engineers review, approve, prepare authorization package with all construction progress and cost information needed to process payment to contractor
- Progress payments withheld if contractor does not submit schedules, updates, and monthly progress reports that comply with contract requirements

Cost Control and Job Accounting Systems

- Cost control based on cost-loaded schedules
- Resident Engineer authorization package contains progress and cost data to update Financial Management System, which tracks budgets and costs by activity, resource type, and FTA-required categories
- Project costs broken down into WBS and incorporated into Code of Accounts—the basis for cost accounting and control system
- Code of accounts breaks project budget into: facilities, commodities, contract packages, engineering and construction management expenses, escalation, and contingency
- GEC responsible for cost control (including preparation of monthly cost reports) under supervision of owner's Manager of Project Control

Change Orders and Claims

- Construction management consultant prepares field change notices/Change Orders for construction contract, negotiates Change Orders, and makes recommendation to GEC on value of changes and impact to schedule
- Change Orders may be initiated by any project member
- Resident Engineer responsible for administration of Change Orders, initiated by change request
- Construction management consultant maintains documentation on potential claims and evaluates, negotiates, and processes contractors' claims

Owner Monitoring/Contractor Reporting

- Owner prepares Capital Progress Status Report—monthly snapshot of project status—based on Resident Engineer authorization package and other submittals
- Owner also prepares more detailed Manager's Monthly Progress Status Report
- GEC responsible for consolidating cost and schedule information for project
- Construction management consultant responsible for project control function in construction contracts
- Owner uses partnering and Alternative Dispute Resolution, including a Dispute Review Board

Escrowed Bid Documentation

- Not used in this project

Verification/Close-Out and Project Delivery

- Owner/GEC responsible for integration of systems and civil work

APPENDIX B

DISCUSSION OF COST-LOADED SCHEDULING

COST-LOADED SCHEDULING

The cost-loaded scheduling approach can provide a consistent link between scheduling, cost control, and management of payments. This synthesis of management control functions can assist both the owner and the contractor in expediting management of a complex project. The combination of management responsibilities into the cost-loaded schedule approach can simplify reporting by the contractor and monitoring requirements by the owner. This approach appears to support the turnkey goals of "fast-tracking" a project while retaining effective principles of project management.

Cost-loaded scheduling also presents several concerns, which should be carefully considered as owners examine the application of this approach to their project. The following is a list of potential benefits and concerns regarding the cost-loaded schedule approach.

Benefits

- The cost-loaded scheduling method allows for definition of cash flow early-on in the contract.

- CPM cost-loaded schedules allow for a more automatic approval of progress payment schedule as well as a streamlining of the progress payment system.

- Cost-loaded schedules "push down" level of responsibility and accountability which can help to "fast-track" a project.

- Cost-loaded schedules provide structure sometimes lacking under traditional scheduling methods.

- Overall project management meetings become focused on the continual update of cost-loaded scheduling reports.

Concerns

- Contractors may express concerns about being confined contractually to costs submitted at Level 4 of detail under cost-loaded scheduling requirements.

- There is hesitation to overall cost-loaded scheduling within the industry.

- Cost-loaded scheduling requires commitment of contractor to itemize and thoroughly quantify each task and related actions through proposal process.

- Cost-loaded scheduling provides higher degree of project management control, although this may run counter to turnkey's expected encouragement of less "top-down" control.

APPENDIX C

BIBLIOGRAPHY

BIBLIOGRAPHY

1. *Baltimore Turnkey Evaluation Plan,* Booz·Allen & Hamilton, December 1995.

2. *BART Extension to the San Francisco International Airport*, P. Takis Salpeas and Thomas E. Margro, Bay Area Rapid Transit District, June 1995.

3. *Environmental Issues in the Turnkey Process*, Stephen R. Beard, ICF Kaiser Engineers, Inc., June 1993.

4. *Evaluation of Houston's Turnkey Experience*, Booz·Allen & Hamilton, July 1994.

5. *Formal Request for Participation in the Federal Transit Administration (FTA) Turnkey Demonstration Project*, Puerto Rico Department of Transportation and Public Works, February 26, 1993.

6. *Hudson-Bergen Light Rail Transit System Project Management Plan (draft)*, New Jersey Transit, August 1996.

7. *Hudson-Bergen Light Rail Transit System Proposal Solicitation Package,* New Jersey Transit, January 1996 (and previous versions).

8. *Innovative Procurement Methods: Review of Issues, Experience, and Applications to FTA-Funded Fixed Guideway Projects: Draft Final Report,* EG&G Dynatrend Inc. and Jeffrey A. Parker and Associates, March 1992.

9. *The Next Step in the Turnkey Demonstration Program: Developing an Effective Contract*, presentation by Geoffrey S. Yarema to APTA/FTA Workshop, Miami Beach, Florida, June 1993.

10. Mass *Transit Administration Central Light Rail Line Phase II Project Management Plan*, Maryland Mass Transit Administration, June 23, 1995.

11. *Phase I of Tren Urbano Systems and Test Track Turnkey Contract Request for Proposals*, Puerto Rico Department of Transportation and Public Works, November 1995 (and previous versions).

12. *Project and Construction Management Guidelines: 1996 Update*, EG&G Dynatrend Inc., June 1996.

13. *Review of Project Management Control Systems on Selected FTA Funded Projects*, Hill International, June 1994.

14. *San Juan Turnkey Evaluation Plan*, Booz·Allen & Hamilton Inc., April 1996.

15. *Turnkey Demonstration Program: Expert Roundtable Workshop on San Juan Tren Urbano,* Federal Transit Administration, November 16-17, 1994.

16. *Turnkey Demonstration Program: Expert Roundtable Workshop on Techniques for Successful Design/Build for Transit*, Federal Transit Administration, March 4, 1994.

17. *Turnkey Development Program Workshop: Workshop Synopsis*, Booz·Allen & Hamilton, Inc. and George Mason University, June 1993.

18. *Turnkey Evaluation Guidelines*, prepared by the Volpe National Transportation Systems Center, Research and Special Programs Administration, June 1996.

19. *Turnkey Procurement Opportunities and Issues*, EG&G Dynatrend, June 1992.

PART III

IDENTIFICATION AND MANAGEMENT OF RISK ON TURNKEY TRANSIT PROJECTS

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IDENTIFICATION AND MANAGEMENT OF RISK ON TURNKEY TRANSIT PROJECTS

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ABSTRACT

The objective of this paper is to identify all types of risk that relate to transit capital projects, describe the mechanisms that can be used to minimize and control each type of risk, explain how risks may be handled differently under turnkey procurement in comparison to traditional methods, determine an optimal allocation of risk among project participants, and measure quantitatively the specific differences between the costs of risk for the turnkey demonstration projects relative to the appropriate counterfactual.

In comparing turnkey with traditional procurement, two characteristics must be recognized:

(1) **Turnkey Procurement Requires Making Risks Explicit**. Because the turnkey contractor wants to know who is bearing which risks, and will charge for those assigned to the contractor or are unclear in their assignment, using the turnkey method requires making risks explicit that may not have been acknowledged under traditional procurement methods.

(2) **Different Risk Control Methods Are Used With Turnkey**. Partly because they are explicit, and partly because the turnkey method results in a different strategy for controlling risks, the mix of risk management instruments will be different.

Although much is known about dealing with various risks, systematic explication of practice is hard to find; moreover, much of the knowledge is microscopic and pragmatic, hence not easily generalized. This paper seeks to synthesize a few basic concepts into a framework that will be helpful to those who must address problems of risk in transit project development.

RISKS, CONSEQUENCES, AND INSTRUMENTS

Understanding the subject of risk requires a careful definition of terms and concepts. The fundamental components of risk are shown in Figure 1, namely: risks, consequences, and instruments. Risk cannot be eliminated, it can only be minimized to its inherent or irreducible level for each type of risk, so it always exists at some level. Consequences are the undesired impacts of adverse events or conditions that are not or cannot be controlled, ultimately resulting in additional costs, delay, and qualitative changes in the project. Prevention, anticipation, and early detection through monitoring are the tools of risk management for minimizing the cost of risk.

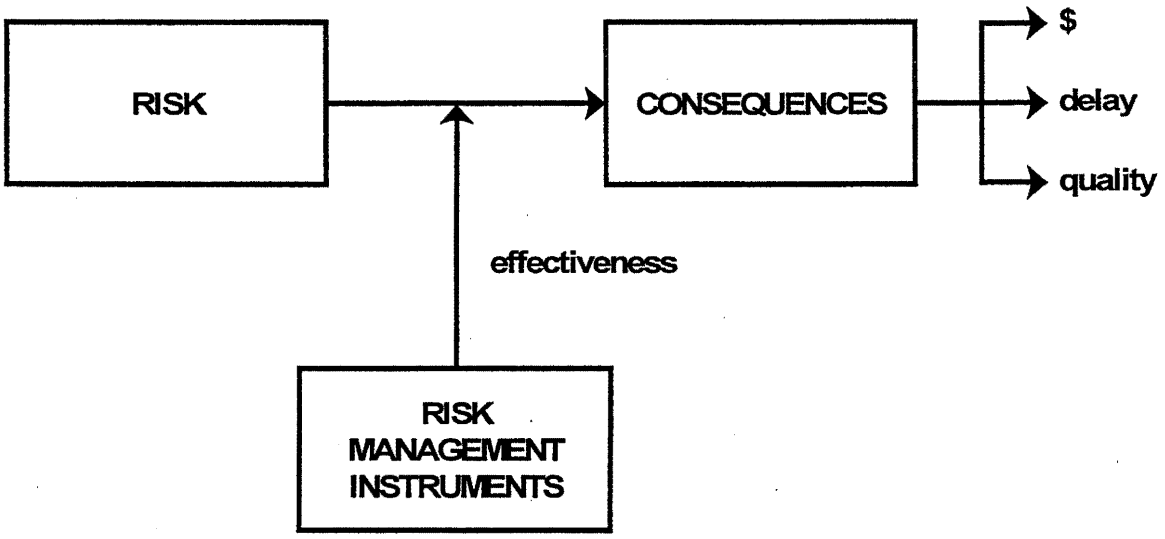


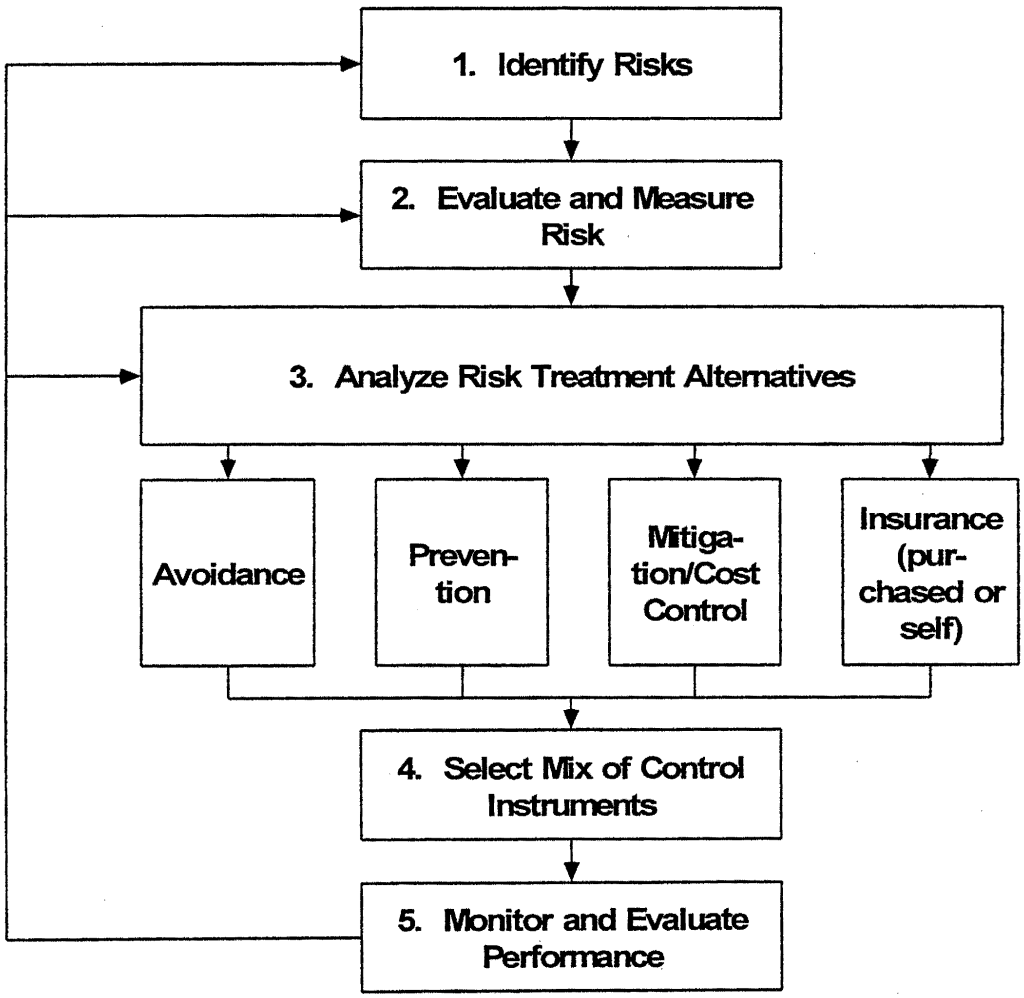
Figure 1. Fundamental components of risk management.

For example, funding is a type of risk, to wit, the possibility that the owner of the project (the government) will be unwilling to make the financial commitments necessary to continue the project. Securing a Full Funding Grant Agreement from the federal government is an important instrument for reducing this risk. To the extent the risk still remains, contractors will be less willing to invest in preparations for which there is some possibility they will not earn a return, even though this strategy increases total costs if the project is completed. This hedging by the contractor is another instrument for risk management.

The objective of minimizing the consequences of risk is served by applying the optimal mix of risk management instruments, whose effectiveness depends upon the suitability of the instrument for the risk, the allocation of risk to participating parties, and the characteristics of the context.

THE RISK MANAGEMENT PROCESS

The process for managing risk can be generalized in a simple form, as shown in Figure 2. Step one is to identify all the risks in mutually exclusive and exhaustive categories. Then, for each risk, the likelihood of the risk and the cost of its consequences should be estimated, from actuarial or other data. Third, the spectrum of instruments for treating the risk should be reviewed, and a suitable package designed for the particular risk. In step four this package is optimized, and in step five the results are monitored and evaluated.



Source: adapted from Kaddatz (1995)

Figure 2. The risk management process.

Step two embodies the basic risk equation, described below. Alternative treatments range from avoiding the risk on the basis that the gains from accepting it are not worth the costs, to purchasing insurance. Prevention is aimed at minimizing the risk by reducing the probability of unwanted occurrences, and cost control is aimed at minimizing the consequences should an unwanted event occur. To the extent that different instruments or treatments are available for any given type of risk, they may be employed in combination to optimize the cost-versus-risk-reduction tradeoff.

Insurance is then the monetary equivalent of the residual risk (self-insurance avoids making the cost explicit, but nonetheless has a monetary equivalent as if the insurance were purchased). The treatments are optimized when the marginal cost of applicable treatments are all equal, and equal to the marginal savings on insurance premiums. In other words, resources can be deployed at prevention, mitigation, and insurance in a way that minimizes the total cost of the risk.

In monitoring the results, new risks may be identified (going back to step one), the probabilities of occurrences and the costs of consequences will be refined by obtaining additional experience (step two), and more knowledge will be gained about the effectiveness of treatment options (step three). To maintain the turnkey objective of minimum interference with the design-build contractor, monitoring must be continuous but only permit intervention if critical indicators exceed predetermined thresholds.

"Causes" of Risk

There are no causes of risk, as such. Since risk is inherent, an apparent cause or source of risk (e.g., poor cost estimates) is actually the failure to exercise a risk management instrument (reviewing and checking cost estimates). This confusion between the risk and the associated risk management instruments can be corrected by very careful enumeration of risks and risk management instruments, and sorting them into their proper categories. The phrase "sources of risk" is less misleading.

Schedule and Cost Consequences

Risk implies that some variation from the intended or planned is possible, and this can be recognized in advance and efforts made to both minimize the likelihood of adverse conditions and mitigate their consequences. In other words, unintended events may occur, which then have adverse consequences. The consequences are increased cost, delay in completion, and reduced quality.

Higher cost and a longer schedule, then, are not risks in themselves, but the consequences of risks. The risk of delay cannot be addressed without knowing all the causes of delay and their individual probabilities. Fundamentally, we are interested in the root sources of risk -- the factors that create the variability in outcomes.[1]

Insurance

The residual risk that remains after all suitable risk management instruments have been applied must necessarily be borne by some party, but perhaps pooled with other parties facing similar risks, through insurance. To the extent that an adverse consequence can be offset by monetary payment, insurance is the monetary equivalent of the risk. Not all risk is adequately offset by compensation; the owner is primarily interested in ensuring that the project is completed, and monetary compensation is only a temporary means toward that end. Also, even if monetary compensation would be satisfactory, not all such risks are insurable, meaning that there is no market for the insurance. The following principles generally apply to the insurance market:

(1) Insurance should be obtained primarily for catastrophic risk; other risks should be self-insured. "Catastrophic" means that the potential payout would be ruinous if it occurred at one time. Insuring for non-catastrophic risks has the benefit of smoothing payments out over time, but at the cost of overall higher payments to cover administrative costs. Additionally, the insured is likely to be categorized with others having higher risks.

(2) The insurer seeks to segregate risks into similar pools, and avoid high and unknown risks. To compete in the market, the insurer wants to charge the lowest rates for any category, and to keep costs as low as possible within the category by accepting the lowest risks. Thus the insurer has an incentive to encourage and help the insured take actions to reduce risk.

(3) The insured wants to join with others of equal or lower risk. Thus the insured will take actions to reduce risk, if this results in a lower risk classification and the savings exceed the costs.

(4) In an efficient system, irreducible risk is shared among insurers and insured, in accordance with (1). Moral hazard is eliminated to the extent that controllable risk is not shifted onto insurers.

[1] It might said that death and taxes are risks, but knowing the statistical average (length of life, magnitude of taxes) for a large population is not very useful information. Instead, if risk characteristics and behaviors can be discovered (smoking, lack of exercise, family history, tax exposure), then the probability distributions can be located and narrowed a great deal. Death and taxes are analogous to cost and delay; risk management is analogous to cutting out smoking and being careful about for whom you cast your vote.

Assuming that monetary compensation is adequate, then the party to whom the risk is allocated has the choice of whether to purchase insurance or to self-insure (establishing financial soundness or bonding, if suitable). The insurer will seek to assess the expected value of the risk by investigating the insured's procedures, and monitoring conformance to specifications.[2]

Some risks can be reduced or mitigated by monitoring activities and progress. Management control systems are intended to provide the information needed to be able to compare planned or expected status with actual, on such measures as cost and percent completed. Under turnkey, less monitoring information is provided to the owner than under traditional methods, more of the information is generated by the contractor, and the owner has less opportunity to intervene in the process. Thus the management control problem is shifted onto the contractor. Management control systems allow attention to be focused on those activities that show symptoms of getting out of line.[3]

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[2] Discussions of the insurance market for bus accidents include Abacus (1996), and Kaddatz (1995); for highway accident liability see Lewis (1994)

[3] See Schneck, "Project Management Control," prepared for this Workshop.

IDENTIFYING THE TYPES OF RISK

Uncertainties, unknowns, and unforeseen events are inherent in capital construction projects. The list of risks presented in Table 1 is intended to be both exhaustive and non-overlapping, with respect to the types of transit projects for which turnkey methods are applicable. The exact number of categories is discretionary, in that some groups could be broken up (e.g., construction performance into safety, site security, cost underestimation, and completion) or others aggregated (e.g., combining design risks with construction risks). An ideal partition would result in a unique mapping of risk management instruments into risk types, but inevitably there are some instruments applicable to several risks (e.g., good communication, insurance for catastrophic risk, prevention and mitigation, are universal instruments). The description of each risk is followed below by some of the risk management instruments that can be used to reduce the particular type of risk.

Political Risk

Political risk can occur at any time, even after all funding has been secured, permits approved, and construction well along. Community participation helps to keep neighborhoods informed and avoids surprises. At earlier stages, political consensus is critical and requires substantial effort. Too many projects have attempted to proceed without sufficient consensus, in the hope of garnering support as things moved ahead. Turning over a project to a con- tractor before political consensus is achieved is risky and not likely to succeed.

Funding Risk

Funding is the acquisition of financial resources, or their promise, that are sufficient to pay for the project. For all practical purposes, this is the owner's responsibility. The exceptions are (1) when an integrated contractor or equipment supplier believes that their long term interest justifies providing some seed money (or services-in-kind) to the project, or (2) part of the payment for the project is in the form of land development rights associated with the project. This second is known as joint development, and has proven to be highly risky as a means for funding a project.[4]

Financing Risk

As distinct from funding, financing is the process of borrowing (against future promises of income) and lending (earning interest on idle balances). Problems stem from lack of credibility of future promises or expected income.

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[4] See Figura, "Financing Turnkey Projects" prepared for this Workshop.

Table 1. Types of Transit Project Risk

	Risk	Description
1	Political	Collective decision process, agreements among local government agencies, willingness of interest groups to reopen prior decisions, ability of groups to disrupt or impede process; environmental reviews; historic, archeological, and religious sites; legal challenges to project continuation.
2	Funding	Commitments by public and private participants to provide monetary and in-kind contributions to support the project; successful access to transit-associated revenue producing activities such as joint development.
3	Financing	Willingness of financial institutions to lend money based on the opportunity costs of funds and the perceived level of funding commitments, to allow matching of cash flow with expenditures.
4	Right-of-way	Acquisition of necessary ROW in sufficient time to avoid delays in design and construction; ability to use alternative ROW if needed or feasible.
5	Speculative effort	Chance that planning and design work undertaken for the purpose of securing funding or contracts will fail to produce offsetting revenues.
6	Bids exceed estimates	Submitted bids exceed cost estimates so that the budget becomes insufficient to accomplish planned construction; overly optimistic initial cost estimates by owner.
7	Geotechnical	Difference between what is known about subsurface conditions and the actual nature of such conditions (not including utilities); seismic conditions; archeological artifacts and sacred burial rounds.
8	Hazardous materials	Disposal of hazardous waste, previously known or not; unexpected discovery of toxic, nuclear, or otherwise hazardous materials during construction that require costly disposal or treatment; environmental liability for toxic waste.
9	Underground utilities	Deviation between stated and actual locations of underground utilities, and the unknown existence of pipes, conduits, etc., that may or may not be obsolete.
10	Inflation	Growth in the general level of prices or relevant components of general prices that are incorrectly forecast or which change so as to substantially alter the relative magnitudes of cost components.

Table 1. Types of Transit Project Risk (Cont'd)

	Risk	Description
11	Application of government regulations	Changes in federal, state, or local regulations or changes in the legal interpretations of existing regulations that create unanticipated costs, including Buy America, Davis-Bacon, OSHA, DBE, FTA, state employment regulations, and local codes; compliance with requirements of independent state and local agencies; responsibility for public convenience and safety.
12	Permit Approval	Possibility that required permits will not be issued or approved in sufficient time to permit the project to remain on schedule, or will require additional work or impose additional constraints.
13	Design and system integration	Possibility that the subelements of design or the subsystems of the project do not form a coherent functioning whole; design errors; cost or performance of untried or unfamiliar technology; coordination among contractors, subcontractors, and owner in design.
14	Changed requirements	Changed or unanticipated requirements discovered after the point in the development process when they should have appropriately been incorporated.
15	Construction performance	Facility is constructed in accordance with approved plans; hidden defects, covered up without external evidence; skill shortages, labor conflicts; contractor fails to produce the facility, or lacks the capacity to finish the job; adverse weather conditions; subcontractor fails to perform; subsystem and system tests; construction safety and site security; compliance with materials handling laws; actual costs exceed contractor's estimate.
16	Act of god (force majeur)	Earthquake, flood, hurricane and similar natural catastrophes during construction that can only be mitigated at best.
17	Operating	Possibility that the system will not generate adequate capacity, or will otherwise result in unexpected operating costs or conditions.
18	Market (ridership or revenue)	Possibility that the service will not attract sufficient customers at reasonable fares to generate planned revenues (revenue bonds or parking garages); decline in value of revenue source.
19	Contested Decisions	Appeals, disputes, claims, patent infringements, suits, or other conflicts arising from disagreement over decisions or actions made or taken, contested through established procedures or the legal system (as opposed to political controversy).

Contracting and equipment consortia may sometimes be willing to effectively contribute up-front capital financing by working for some period of time using their own retained earnings to finance the project, assuming they are eventually paid in full.

Right-of-Way Risk

If an alignment has been determined, then an agency possessing powers of eminent domain is normally needed to obtain the right-of-way. Except in unusual circumstances, this is the owner. Private firms are not granted rights of eminent domain. An example of this risk is failure to acquire the ROW in time to avoid delaying the design/build contractor.

Thorough planning with sufficient lead time is the only way to reduce risk of ROW not being available when needed.

Speculative Effort

Private firms or government agencies may spend time and effort in the hope of receiving revenues in the future, even though the efforts are ultimately unsuccessful. This is a risk that rational organizations may choose to take, but becomes dangerous if they are spending someone else's money. Public agencies can get in trouble for this if they use funds provided for another purpose; private firms may suffer the consequences in their profits or stock valuations.

The most important consideration in preventing unwarranted speculative effort is to avoid putting out misleading information. A public agency that assures potential contractors that funding has been secured when it has not is engaging in unethical conduct and may be liable for suit.

Bids Exceed Estimates

Some variation in the bid price, all other things being equal, is due to regional and national economic conditions, the demand for similar contracting and construction services, and the perceptions of bidders. If bids are too high for these reasons, then it is possible to hold off and re-bid at a later time.

Other reasons for high bids are lack of competition, poor cost estimates, inefficient allocation of risk through, say, boilerplate RFP provisions that require excessive insurance or bonding, and other cost or risk factors that lead bidders to err on the side of caution. Competition can be enhanced by proper pre-qualification of bidders, industry review, recommended organizational structures (e.g., single construction manager), and bonding and insurance requirements that are neither too high nor too low.

Geotechnical/Site Conditions Risk

Part of what lies beneath the surface of the earth is "natural," even if disturbed or composed of fill or otherwise altered by humans, and part is underground utilities. Geotechnical refers to the former, and includes soils, bedrock, seismic faults, underground water, and other subsurface conditions. Constructions methods, and cost, vary greatly depending upon these conditions. The means for reducing the risk of unknown conditions is the taking of test borings, at locations that will allow what lies in between to be interpolated.

If the owner generates the data and guarantees the accuracy of the interpretations, then any costs incurred by the contractor because the conditions were not as portrayed are the responsibility of the owner. Alternatively, if the owner simply provides what information it has (whether a little or a lot), the contractor bears the costs of dealing with whatever is actually there, and bids will reflect this risk according to how confident the contractor is of actual conditions before encountering them. Included in site conditions risks are archeological finds and Indian burial grounds, or other sacred sites not detectable prior to excavation.

Hazardous Materials

Most hazardous and toxic materials are created by human activity, and are often deemed hazardous by public agencies in small or trace amounts. Especially as a consequence of "Superfund," legal liability for cleaning up hazardous sites may be contested at high legal cost taking long periods of time, and the costs of cleanup may be astronomical. Thus the cost risk of dealing with hazardous materials can greatly exceed the true risk of injury and actual damages. Other hazardous materials are associated with the construction itself, but the risks here are minimized by adhering to standard practices, complying with regulations, and following mandated or certified procedures.

Dealing with "brownfields" can be risky, but it is possible for the relevant parties to reach an agreement that is acceptable to federal and state regulatory agencies and will stand up in court, allowing the costs to be estimated beforehand and the risks of open-ended liability to be minimized.

Underground Utilities

One of the more notorious and hence highly visible risks stems from the presence of and need to relocate underground power, gas, telephone, and water utility lines and tunnels. For many of these, the owner of the utility (power company, phone company) must do the relocation, adding uncertainty to the schedule.

Instruments for managing this risk include the maintenance of accurate and current information on utility locations, accurate and complete plans to ensure that relocations are needed and will be correct, sufficient lead time to allow utility owners to ensure completion while also dealing with emergencies, and clear assignment of responsibilities.

Inflation

Prices in general tend to rise over time, for the same or equivalent goods, and costs of construction and engineering and design services also rise, not necessarily at the same rates. An allowance for inflation is routinely built into cost estimates for budgeting purposes, and in contractor's pricing. The risk is that these estimates of inflation will be in error.

A period of high inflation in the late 1970s caught many people by surprise, and those bearing the risk suffered losses. The owner bears part of the risk in securing funding that is adequate to absorb inflation at the time the funding is transferred to the owner, and the contractor normally bears the risk once a contract has been signed.

Government Regulatory Risk

Changes in federal, state, and local regulations, or the unpredictability of their enforcement (including graft, bribery and other corruption) or interpretation can lead to unanticipated costs or delays.

Current regulations should be fully understood, including the practice of their application. Changes are usually under consideration for some time before they are enacted, and if this raises uncertainty, then contract conditions can be devised to remove or assign the risk.

Permit Approvals

Numerous permits from public agencies are required to complete a project, and often these require considerable detail on design, construction method and environmental impacts. Not only may these permits be technically demanding, they frequently become focus points for political opposition to some aspect of the project. Neighborhoods may become concerned, rightly or wrongly, about such impacts as vibration from underground tracks, after construction is well underway.

The general strategy for minimizing this risk is to work with permitting agencies and activist groups to learn their concerns, address them in an acceptable way, and keep all interested parties informed through outreach and citizen participation processes.[5]

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[5] See Mendes, "Environmental Compliance in Turnkey Transportation Projects" which describes strategies for minimizing risk that a project will be held up due to environmental permitting.

Changed Requirements

Changes in the owner's requirements for the project stem from information gained while the project is being implemented. This information can be broken into three categories: information applicable to decisions about how to implement the owner's objectives, information that could have been obtained or obviated by the owner before implementation, and information whose implications could not have been known in advance.

The design/build approach can substantially reduce the first of these and create incentives to minimize the second. If the owner's objectives are stated in generic and performance terms, rather than detailed unique specifications, decisions about the best way to achieve the objectives become shared. At agreed-upon stages in the design and construction, the owner approves the plans prepared by the contractor. If the owner anticipates changed requirements, these can be incorporated into these plans and the cost-minimizing method found for accomplishing them. Knowing that the cost consequences of changed requirements discovered later rather than earlier is much greater, the owner can concentrate efforts on probing the requirements rather than writing bullet-proof specifications for every detail. Unit costs or price lists can facilitate change orders when they are necessary.

Design and System Integration Risk

Failure of the plans and specifications to work properly is the responsibility of the architects and engineers that design and oversee the installation. If the technology is new or unfamiliar, the challenge is greater than for an extension of an existing system.

Design errors can be caught through review by other design professionals, including outside experts conducting value engineering, review by the owner, and subsystem tests.[6] Design professionals may be required to have insurance to ensure that serious design errors do not cost the owner. Integration depends upon coordination among teams designing different aspects, which requires good communication and an atmosphere of cooperation and thoroughness rather than suspicion and haste.

Construction Performance

Ensuring that the physical construction conforms to the plans and specifications agreed upon (including any changes) is primarily the responsibility of the construction contractor, who has to deal with weather conditions, labor strikes, trade unions, subcontractors, shortages, and numerous other potential problems in producing the planned facility.

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[6] See Luglio, "Transit Turnkey Design and Construction," prepared for this Workshop.

To assure that the construction does, in fact, conform to plans, the owner must be able to inspect periodically (e.g., to detect defects that would not be observable once they are covered up). A third party might be employed for inspection, and groundrules established so that these inspections caused minimal disruption of the construction. System tests are part of the quality assurance for construction performance. Workplace safety and protection of the site from vandalism, accidents, and theft are the responsibility of the contractor, but it also in the owner's interest to see that the project is not shut down or bankrupted by sloppy safety and security. Contractor pre-qualification is a means of ensuring that all bidders are capable of dealing with the rigors entailed by the particular project.[7] Liquidated damages provisions, progress payments, and contingency plans can help ensure construction performance.

It is in the owner's interest to get the job done for the lowest price, but not at a price that bankrupts the contractor. Cost underestimation by the contractor should be avoided by informing potential bidders of the full nature of the project and possible problems.

Acts of God

Natural events whose possibility may be known, but whose timing and magnitude cannot, and whose consequences are major, are labeled "Acts of God." An especially cold winter or a 100-year flood are classified as weather conditions, whereas a hurricane or earthquake are acts of God.

Although such natural events cannot be foreseen, their effects can be mitigated by taking proper precautions or preparatory measures. Tunnels can be designed to survive earthquakes, and things can be battened down for a hurricane. Insurance can be purchased so as to spread the risk, but it should not induce the moral hazard of being unprepared because someone else is paying for it.

Operating Risk

Failure of the system to operate properly, including inadequate capacity, excessive headways, unreliability, doors that won't open, computer systems that crash or crash trains, and high failure rates, means that the facility is unable to perform its intended function. To the extent these are due to design flaws or poor construction performance, the problems should have been discovered prior to operation. External review, value engineering, and testing help to minimize operating risk.

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[7] See Thomas and Smith, Criteria for Qualifying Contractors for Bidding Purposes (1994), on pre-qualification for highway contractors. Another device sometimes used for highways is the long-term performance guarantee, or warranty; see Hancher, Use of Warranties in Road Construction (1994). Another is the required contract period of performance; see Herbsman, Determination of Contract Time for Highway Construction Projects (1995). BART has decided that it will establish control surveys guaranteed by the owner, and the contractor is covered if all its construction surveys are correct with respect to the benchmarks.

Market Risk

For all major public transit facilities built in the last several decades, the risk of ridership and revenues being less than forecast has been borne by the owner. The potential advantage of passing off market risk to a private entity is that the proposed benefits of the project might get a hard-nosed scrutiny in advance, perhaps leading to better alignment or other characteristics that might cost more initially but result in much greater long-term benefits.

Contested Decisions

At all points in the process, from planning and procurement to construction and operation, agreements between parties may be contested by one of the parties. Loosing bidders appeal the award, opponents protest the EIS, contractors litigate claims, and subcontractors sue contractors and owners. As with other risks, all proper preventive measures can be taken, but a residual risk remains even if the agreements are sound and the procedures are fair. Such conflicts necessarily increase costs and can also lead to delays.

Broadly applicable strategies for reducing claims are good communication and disclosure of relevant information; procedures spelled out in advance for all contingencies, including termination; documentation of the basis for important decisions; alternative dispute resolution (ADR) techniques; and contract language that is specific about performance requirements but flexible in their achievement.[8]

[8] See Lee, Sheehan, and Mattson, Turnkey Evaluation Guidelines (1996), Section 7.3 for a brief review of ADR. See also Bramble and Cipollini (1995) and Enfiedjian and Lytle "Procurement and Subcontracting in Turnkey Projects" prepared for this Workshop.

RISK MANAGEMENT INSTRUMENTS

Although the previous discussion included risk management instruments in the discussion of each risk, there was no complete listing of the instruments available. This is provided in Table 2.

Most of these instruments have been developed and applied in numerous ways in transit project contexts. Some, such as ADR, are relatively new and experience with them is not sufficient to judge their full efficacy.

Table 2. Risk Management Instruments

Instrument	Description
Full Funding Grant Agreement	Agreement between FTA and owner to provide a total amount of funding under given conditions.
Record of Decision	Letter of Intent from FTA indicating that the project is approved for federal funding.
Letter of Credit	Indication of willingness by lender to allow borrower to receive funds.
Board Resolution	Public commitment by local legislative body to provide funds or in-kind contributions.
Reserve Funds	Deposit of funds in a restricted account as evidence of ability to pay.
Contingency Funds	Set-aside of revenues beyond anticipated requirements to allow for unexpected needs.
Dedicated Taxes	Earmarked tax instruments of revenues as evidence of political funding commitment.
Bonding	Insurance (performance bond) required of contractor to ensure that resources are available to complete the project if the contractor should fail for some reason.
Subordinated Debt	Financial instrument whose claims for repayment are subordinate to (come after) other financial instruments.
Insurance	Means for pooling risks of a similar type among many entities.
Fixed Price Contract	Contractor is obligated to deliver specified product for a predetermined price.
Contract Agreements	Legally binding agreements among participating parties that specify actions that will occur under all contingencies.
Cost Indexing	Unit prices or fixed prices are adjusted according to an agreed-upon price index.
Liability Caps	Specify the maximum amount a party can be held responsible for under stated conditions.

Table 2. Risk Management Instruments (Cont'd)

Instrument	Description
Public-Private Partnerships	Agreements among public agencies and private sector participants to share risks and responsibilities.
Project Management Oversight	Third-party overseer of project management to ensure proper controls.
Pre-qualification	Scrutiny of potential contractors' capabilities, previous performance, and experience to assess capacity and reliability.
Corporate Guarantees	Binding commitments from members of joint venture consortium.
Risk Isolation	Identifying and fencing off (partitioning) selected risks (e.g., utilities) so as to remove uncertainty from other functions (e.g., construction).
Information	Providing additional knowledge that reduces the degree of uncertainty (e.g., geotechnical)
Multiple Contracts	Breaking the project into subprojects, reducing the probability that a single failure will bring down the project.
Accommodation	Willingness to make appropriate accommodations within the scope of a contract so as to minimize unnecessary costs
Schedule and Cost Control Reporting	Requirements to report milestones, measures taken to control costs, results, and other progress information.
Incentive Clauses	Schedule rewards and penalties, value engineering incentives, and other performance incentives.
QualityAssurance/Quality Control	Supervision, review, inspection, and testing to ensure that the final product meets specifications.
Arbitration	Submission of disputes to binding or non-binding arbitration.
Alternative Dispute Resolution	Procedures for airing complaints and resolving conflicts before they reach the point of requiring arbitration.
Pre-Nuptial Agreements	Statements of termination and dispute procedures, roles and responsibilities as part of initial contractual agreements.
Good Communication	Create channels of communication and discussion that ensure that all parties have the same expectations about roles and responsibilities, and outcomes.

ALLOCATION OF RISK TO PARTICIPANTS

Table 3 indicates the range of discretion that seems feasible with respect to sharing each risk between owner and contractor. Other entities may participate in either the owner's risk or the contractor's, depending upon the organizational structure of the owner and the contractor. The mechanisms for allocating risk are primarily the RFP and the contracts between the owner and design/build contractor.[9]

Table 3. Risk Allocation to Participants

Risk	Owner	Contractor
Political	full	
Funding	full	may participate
Financing	full	may participate
Right-of-way	full	up to full
Speculative Effort	before RFP	before RFP
Bids exceed estimates	full	
Geotechnical	discretionary	discretionary
Hazardous materials	discretionary	discretionary
Underground utilities	discretionary	discretionary
Inflation	prior to award	after award
Application of government regulations	regulatory changes only	full compliance with existing regulations
Permit Approval	traditional	may participate
Design and system integration	traditional	turnkey
Changed requirements	full	
Construction performance	may share	full
Act of god (force majeur)		full (insurance)
Operating	Design-Build	Design-Build-Operate
Market (ridership or revenue)	Design-Build	Design-Build-Operate
Contested decisions	partial	partial

[9] See Lee, Sheehan, and Mattson, Turnkey Evaluation Guidelines (1996), Chapter 7 for a comprehensive overview of contracts and procurement management.

An example of how this discretion can be applied is shown in Table 4, describing the risk allocation used for the Baltimore light rail extension project.[10] If several types of risk can be bundled together and assigned to a single party, who is in a position to deal with the risks individually and synergistically, then this is a desirable allocation of risk. For example, a single design/build entity should be responsible for all electrical systems, rather than having each contractor doing their own and relying on different contractor to integrate them.

Table 4. Baltimore Design/Build Project Risk Allocation

Risk	Owner Share	Contractor Share
Political	Full risk	None
Funding	Full risk	None
Right-of-way	Full risk	None
Geotechnical	Available information provided to contractor; no risk assumed.	Contractor must carry out any additional geotechnical investigations needed.
Hazardous Materials	Full risk	Contractor is paid to remove and dispose of hazardous materials on unit cost basis.
Underground Utilities	Owner must identify all utilities, and will relocate private utilities.	Contractor relocates public utilities.
Inflation	none	Full risk
Federal and local requirements	Owner accepts risk for any changes in requirements subsequent to bid.	Contractor responsible for compliance.
Design and Integration	None (Owner reviews designs but does not approve)	Full risk, without regard for owner reviews.
Construction	None; oversight provided to ensure conformity to specs	Full risk
Quality Assurance and Control	Owner performs spot checks and QA/QC audits	Full risk of correcting any deficiencies identified.
Construction Safety	None	Full risk
Site Security	None	Full risk

[10] For other descriptions of risk allocation on recent projects, see Schneck and Stross (1996) and Schneck and Laver (1994).

Value Engineering

As described in the ***Federal Transit Project Management Guidelines for Grantees***, FTA Circular 5010.1B, FTA requires VE on new fixed guideway projects estimated to cost more than $100 million or which the Administrator determines to be major. Grantees are encouraged (but not required) to conduct VE on all construction projects including bus maintenance and storage facilities whose costs are estimated to exceed $2 million, and on revenue railcar acquisition and rehabilitation. As part of FTA's Project Management Oversight (PMO) Program, PMO contractors routinely review owner VE studies and the resulting changes accepted by the owner.

To provide information and to advance the VE concept, FTA sponsored the report entitled ***Value Engineering Process Overview*** (UMTA-DC-06-0483-88-4 by Lee Wan and Associates, January 1988) and an accompanying workshop program. The topic of VE has also been included in the ***FTA Project and Construction Management Guidelines***, an update of which was completed in June 1996 by EG&G Dynatrend. The Guidelines address the general principles of VE and its application in preliminary engineering (PE), final design and construction.

Quality Assurance/Quality Control

FTA's primary guidance on QA/QC is contained in the ***Quality Assurance and Quality Control Guidelines*** (FTA-MA-06-0189-92-1, EG&G Dynatrend for FTA, March 1992). The Guidelines are adapted from the American National Standards for Quality Systems (ANSI/ASQC Q90 - Q94) which are virtually identical to the International Standard for Quality Systems (ISO 9000-9004). Both standards were issued in 1987. The following 14 elements of a QA/QC system are described in the Guidelines:

- Management Responsibility
- Documented Quality System and Training
- Design Control
- Document Control
- Purchasing
- Product Identification and Traceability
- Process Control
- Inspection and Testing
- Inspection, Measuring and Test Equipment
- Inspection and Test Status
- Nonconformance
- Corrective Action
- Quality Records
- Quality Audits

Requirements for addressing QA/QC within the Project Management Plan (PMP) are defined in "Regulations on Project Management Oversight" (54 FR 36708-36713, September 1, 1989).

FTA requires that the grantee's PMP shall address the following related to QA/QC: #4 - A document control procedure and record-keeping system; #7 - QC and QA functions, procedures, and responsibilities for construction and for system installation, and integration of system components; #8 - Materials testing policies and procedures; and #10 - Criteria and procedures to be used for testing the operational system or its major components.

- Further Guidance is provided by FTA in the *FTA Project and Construction Management Guidelines*, an update of which was completed in June 1996 by EG&G Dynatrend. The Guidelines address the general principles of QA/QC (Chapter 3.4.5), design phase (Chapters 4.4.5 and 5.4.5), construction phase (Chapter 6.4.5), and testing and start-up phase (Chapter 7.4.2).

APPROACH ON CONVENTIONAL PROJECTS

Value Engineering Studies

The guidance described above was formulated for the conventional (design-bid-build) implementation approach. VE studies are typically conducted at or near the end of PE, about 30 to 40 percent of design completion. For some large, complex projects, it may be advantageous to conduct two VE studies, with the second conducted at 60 to 75 percent of completion, but this is rarely done.

The VE study is typically performed during a week-long workshop by a multi-disciplined team of professionals specifically assembled for this purpose. Personnel can include electrical, mechanical, civil/structural and construction engineers, as well as specialists in architecture, cost, construction management and transit operations/maintenance. Most, if not all, of the participants should have a minimum of 40 hours of VE training, and experience in VE workshops, so that efficient use is made of the time allowed for the study. The VE workshop should consist of five phases described as follows:

- *Information Phase* - Obtain project information including design drawings, specifications, cost estimates, design criteria, imposed constraints, site conditions, utilities available, utility rates, and operation and maintenance practices. Receive a presentation by the designers on the progress made to date and visit the site. Review and validate cost information, calculate life cycle costs and construct a cost model. Define the functions of the project; identify the cost and worth of each function; and determine areas of high cost and low worth.

- *Speculation (or Creative) Phase* - Generate a list of alternative methods of performing the functions involved in the targeted areas of the design.

- *Analysis Phase* - Evaluate each of the generated ideas against both functional and cost-reduction requirements, as well as for its feasibility and potential for acceptance by the owner. The less promising alternatives are screened out leaving a small number to develop into full-fledged proposals.

- *Development Phase* - Develop a revised design for each proposed change. After a sketch is drawn up, calculate the life cycle costs for both the original and proposed design, and list the advantages and disadvantages. Consultations can be held with owner and design firm personnel to ensure that the proposed changes are based on the best information available.

- *Presentation Phase* - At the end of the workshop, the VE team meets with designated members of the owner's staff and design consultants to present the design and cost details of the recommended alternatives. Written copies of all proposals are furnished for preliminary review by the owner and its consultants.

The VE consultant submits a draft VE Study Report to the owner. This report should include the project background and description, the scope and methodology of the analyses, a summary of

the VE study recommendations, details of each proposal with estimated costs, expected savings, and back-up documentation.

After final decisions have been made by the review board on adoptions and rejection of the various proposals, the final VE report is prepared. The Final Report should include a summary of accepted proposals with revised capital and implementation costs, as well as a list of rejected proposals and the reasons for rejections.

It may happen that many of the VE proposals are rejected by the owner because they were the result of achieving community support for the project or to mitigate environmental impacts. At a later time, if costs escalate beyond available budgets, some of the rejected VE proposals may be reconsidered as cost reduction measures.

There have been generally positive results of design stage VE studies. As one of the lessons learned from the PMO program, it was documented that for a Fort Worth commuter rail project there were 87 VE proposals offered for consideration with a value of $78 million, of which 38 were accepted for an estimated savings of approximately $11 million, or 14% of the total. The cost to perform the VE study was $129,000, resulting in a return of $85 for every dollar invested in the VE study.

Other Design Refinement Techniques

In addition to VE, many other techniques are frequently used to provide review and specialized input to designs, specifications and procurement documents during both the PE and final design phases and include:

- *Peer Review* - by topic specialists outside of the agency's design team.

- *Design Reviews* - periodically scheduled to include agency staff and other affected organizations representing transit operations/maintenance, safety/security, planning/programming, quality assurance, construction, contracts, finance, etc.

- *Agency/Community Outreach* - to planning and funding agencies, elected officials, the general public, advocacy organizations, and those involved in permitting and utilities.

- *Industry Reviews and Pre-Bid Meetings* - with potential contractors.

As part of the Turnkey Demonstration Program, FTA made teams of experts familiar with turnkey projects and concepts available to grantees for review of their approach and discussion of related issues.

Construction Phase Value Engineering Change Proposals

The construction contract bid documents will describe at least one method for actually accomplishing the required design. Contractors may take the initiative to suggest another approach, e.g., lower cost, shorter time, etc., after the contract has been awarded. The grantee should encourage innovative construction methods which have potential for saving time and money. Procedures should be established for evaluating alternative approaches, such as underpinning techniques and tunneling methods, and for sharing the potential cost savings as an incentive to the construction contractor. The contractor should also be permitted to suggest other changes to the owner's final design which could result in more economic ways to achieve the basic requirements. The contractual mechanism utilized is the VECP which should result in reducing the overall project cost to the owner without impairing essential functions or characteristics. The owner provides a VECP clause in the construction bid documents, reviews contractor proposals, and shares the accepted cost savings with the contractor.

Quality Assurance/Quality Control

On conventional contracts, the owner has primary responsibility for preparation of final design, construction contract bid package development, contractor and equipment procurement, and management and integration of the work of numerous contractors. While it has become accepted practice for construction contractors to be responsible for QC functions, the owner maintains responsibility for QA functions, possibly supported by a construction management (CM) consultant.

The owner should have a detailed QA/QC Plan to guide their QA activities and define contractor responsibilities. The contractor's QC responsibilities are stated in contract documents. The contractor is typically required to have a senior quality manager who is independent from the organization actually performing the work, and to develop a quality plan. The quality plan must be submitted for the owner's review and approval. The owner's QA effort then consists of monitoring the contractors adherence to their quality plan and conducting audits to independently verify the contractor's performance.

Contractor Implementation Freedom

In the conventional implementation approach, detailed plans and specifications encompassed within the construction procurement documents become the basis for firm fixed-price bids from which the lowest responsible and responsive bidder is selected. Some owners have separate contracts for several construction specialties which are then required to work in the same area. Because transit projects, especially urban fixed-guideway projects, are inherently complex undertakings involving numerous impacts and interest groups, contractor construction activities must be actively planned and monitored by the owner to maintain control and public support. Therefore, severe limits are provided on the contractors' ability to accelerate construction activities. Issues of right-of-way acquisition, utility relocation, permits and approvals, construction site access, coordination with other contractors, maintenance of traffic, community relations and schedule coordination give the owner the mandate to control the progress of the

contractor. Construction related to an existing operating transit system has additional issues of worker and patron safety, maintained through owner force account labor for flagging operations and other functions.

ISSUES REGARDING TURNKEY CONTRACTS

Value Engineering

Because turnkey and other innovative project development mechanism provide contractors with different incentives than the conventional approach, several issues related to VE have been raised, or should be addressed, in conjunction with the FTA's Turnkey Demonstration Program. They include:

- What natural incentives exist in the various forms of turnkey contracts for the contractor to achieve VE goals without a formal VE effort?
- Do the contractor's incentives also benefit the owner?
- When is the best time to perform VE studies?
- Is there a mechanism in the turnkey contract to compensate the owner and the contractor for successful VECPs? What difference does the contract type (firm fixed-price versus cost-reimbursable) and payment mechanism (lump sum versus unit cost) make?
- What is the impact of using a turnkey mechanism to construct an extension to an existing system compare to implementing a completely new transit system? Is the owner less likely to benefit from VE proposals due to the need to maintain compatibility with the existing system?
- Is it possible for an owner's organization to be overburdened by VE proposals?
- Could a large number of VE proposals negatively challenge the owners PE effort and result in political embarrassment and affect public support?
- Should a turnkey contractor be rewarded for VE on its own design?
- Should FTA requirements to perform VE be related to project complexity, instead of or in addition to, the dollar value of the project?

To address these issues, the following is a review of the range of non-conventional implementation approaches which are available and the inherent incentives which exist to achieve VE-type efficiencies. For this review, the issue of financing will not be addressed.

- *Design-Build (D-B) or Turnkey* - Since the contractor has no O&M responsibilities, it only has the incentive to design a system which minimizes its total design, construction, and warranty costs.

- *Design-Build-Operate-Maintain (DBOM) or Superturnkey* - Depending on the O&M period, the contractor also has the incentive to design a system which has some built-in O&M efficiencies such as reliability, maintainability, durability, and energy efficiency.

- *Build-Operate-Transfer (BOT)* - This method usually involves a long-term relationship (20, 50, 100 years) during which the contractor owns the facility and has O&M and capital replacement responsibilities. This provides an incentive for full life-cycle-cost considerations including periodic capital replacement for solely economic (return-on-investment) reasons. After the defined period, the ownership and O&M responsibilities revert back to the sponsoring public agency. An alternative to BOT is BTO, in which ownership, but no other responsibilities, is transferred to the public agency after construction, usually for issues of public liability.

- *Franchise* - This involves a proposal by a contractor to design, construct, finance, own, operate and maintain a transit system authorized by the appropriate public agency. Since the contractor would have the patronage and revenue risk, the opportunity to advance this type of project is very limited and unlikely in this country given the position of public transit versus competing modes of travel. The franchise concept, however, gives the contractor the maximum incentive for controlling all costs, and providing and marketing good service.

The incentives discussed assume that a fixed-price has been established prior to the contractor performing final design. If fixed unit-prices were established instead of a fixed lump-sum prices, the contractor would not have an incentive to control the number of units. It is also possible to have some elements performed on a cost reimbursable basis, e.g., cost plus fixed fee (CPFF), cost plus incentive fee (CPIF) and cost plus award fee (CPAF). Cost reimbursable contracts are usually used for elements which are not well defined or have a large cost uncertainty, but can be extremely risky for an owner with a limited budget and must be aggressively managed.

For compensation during O&M, various contractor responsibilities and payment strategies would have differing sets of incentives. For instance, payment based on the quantity (seat-miles) or quality (on-time performance) of service provided, the number of passenger-miles carried, etc.

Quality Assurance/Quality Control

Issues to be addressed under the Turnkey Demonstration Program related to QA/QC include:

- Is the owner willing to assign responsibility for QA and QC to the contractor in the spirit of turnkey and accept a more limited role of oversight or verification?

- Are the requirements of an adequate quality program sufficiently defined in the procurement documents to guide the turnkey contractor and do contractors generally have the expertise necessary to prepare and implement a QA program?

- How should a contractor's quality program be priced (as a fixed price, an overhead expense, or an allowance) and should there be financial incentives for quality performance?

- If an owner performs a prequalification step in the procurement process, should the contractors' experience in preparing and implementing QA programs and QA management personnel be considered?

- What is the appropriate owner role in reviewing/approving designs and other deliverables, oversight and verification of contractor QA and QC activities, and related functions such as documentation of work accomplished and approval of progress payments?

- Is it prudent to expect that the total costs associated with quality programs on turnkey projects will exceed those on conventional projects, given the attention to quality and the addition of the owners verification function? Will the benefits of these quality programs justify their costs?

Contractor Implementation Freedom

One of the stated benefits of combining final design and construction responsibilities under the control of a single contractor is the ability to fast track certain activities to permit some construction to start prior to completion of all designs. Issues related to this ability include the following:

- For what functions should owners take aggressive responsibility to provide contractors maximum opportunity to reduce the time to implement the project?

- What requirements are imposed by owners on the contractor's freedom to advance implementation activities and are they reasonable?

TURNKEY PROJECT EXPERIENCE

The experience of VE on several (mostly transit) turnkey projects is described in Sections 7.1 - 7.7. The general turnkey experience with QA/QC and contractor implementation freedom is included in Sections 7.8 and 7.9, respectively.

Houston Fixed Guideway Project

The unique characteristics of the METRO project significantly affected the rationale for including a VE incentive program in the turnkey contract for the systems components of the project. Two characteristics of the contract are important. First, a traditional project development process provides the construction contractor with an incentive for seeking cost reduction methods in the sense that the construction contractor or his engineer reviews the design work prepared by the owner's design staff or consultants. In a DB situation, however, the construction contractor and design engineer are part of the same entity. Second, in a traditional project development process with a unit price construction contract, VE proposals which result in reduced quantities of material and labor, result in cost savings which the owner can share with the contractor as an incentive.

With fixed-price contracts, payment is not made for quantities, but for putting in-place a functional product. If the contractor can devise a less expensive method for accomplishing a given task, the savings are, by the nature of the contract, entirely its. Therefore, within the context of this project, VE and peer analysis were primarily methods to be used by METRO to ensure that it was getting a cost-effective product from the DB contractor for the systems components rather than methods to be used by the contractor as part of an incentive program.

Honolulu Rapid Transit Project

This project was to be comprised of three phases of activity for the selected turnkey contractor: Phase 1- PE, Phase 2 - Final Design and Construction, and Phase 3 - Operations and Maintenance, each with a separate notice to proceed. The project was terminated before entering into Phase 2. The City had anticipated undertaking VE studies during the turnkey contractor's PE and final design phases, and could direct the contractor to implement the accepted changes through a change order which would reduce the contract price in accordance with the catalogue of prices which were bid. A formal VE study was performed by an outside consultant which identified 17 proposals with a potential savings of $362 million in a $2+ billion program.

During construction the contractor was permitted to develop and submit cost reduction proposals requiring modification to the contract that resulted in savings to the City by providing less costly items than those specified in the contract. The essential functions and characteristics of these items , including, but not limited to, service life, reliability, appearance, economy of operation, ease of maintenance, necessary standardized features, and the performance of the system must not be impaired, however. Reductions in work scope were expressly not to constitute VE cost reduction proposals. A list of contractor documentation requirements accompanied the VE cost

reduction clause. Accepted cost reduction proposals were to result in an equitable adjustment of the contractor's price by 50 percent of the net estimated decrease in the contractor's cost.

Baltimore Light Rail Phase II

The MTA believes that VE is the process by which the cost-effectiveness of construction is improved by the contractor's offering of alternative designs or construction methods which will meet or exceed the intent of the original contract documents. Since one of the purposes of the DB contract process is to obtain the most cost-effective design and construction products, they believed that VE was inherently build into the project. Thus, no VE studies were conducted and no VECP clauses were contained in the contract documents. FTA waived its VE requirement at the grantee's request.

During final design, however, the turnkey contractor did identify an alternative method for designing a bridge structure which resulted in lower construction costs and a VECP was submitted. The owner agreed to the change and shared the savings with the contractor through a change order. Such a cost saving proposal may have been identified through a VE study which could have resulted in the owner capturing the entire savings. VECPs are designed to routinely give contractors the incentive to identify and develop such cost saving alternatives.

San Juan Tren Urbano

As part of its plan to implement a rapid rail transit system, the Puerto Rico Highway and Transportation Authority (PRHTA) will utilize a Systems and Test Track Turnkey (STTT) contract and six small turnkey contracts for additional civil elements of the project. The STTT contractor will operate and maintain the system for five years with an additional five year option. Both VE studies and VECPs will be utilized. VECPs are encompassed in a section of the STTT contract special provisions entitled "Contractor Recommendations for Design and Technology Enhancements." It states that the goal is to assist the Authority in achieving its objectives for the project, including minimizing the time for design and construction, controlling costs, and enhancing functional performance and aesthetic goals. The contractor shall identify and analyze during the design and construction period technological advancements, alternative design proposals, alternative methods of construction, and alternative selection of materials, equipment and systems which, if employed, under the contract, would promote the achievement of such objectives. In addition, the proposal should not require an unacceptable increase in contract time for the work, but would maintain required functions such as service life, reliability, economy of operation, ease of maintenance and necessary standardized features and appearance. After review of the contractor's appropriate documentation, if the change proposal was accepted, the savings would be shared between the owner and the contractor.

BART San Francisco International Airport Extension

BART's SFO Extension will consist of a conventional site preparation and utilities relocation contract; a line, trackwork and systems turnkey contract; three station turnkey contracts; and separate agreements to acquire vehicles and to have transit facilities constructed at the airport. VE studies will be performed during PE by outside consultants prior to procuring turnkey contractors. A VE study for the line contract is currently under review by BART. It has identified about $67 million in potential savings on a $400+ million contract and has offered several suggestions related to system design and project management issues.

BART will also permit VECPs which recommend changes to the contract drawings, contract specifications, or design criteria furnished by BART, but not to designs or contract documents furnished by the contractor. The cost savings associated with accepted VECPs will be shared 50-50 with the contractor.

New Jersey Transit Hudson-Bergen Light Rail Transit System

This project is a DBOM contract with O&M costs fixed for 15 years. This contracting mechanism provides strong incentives for cost-effective design and construction with life cycle cost considerations. The contractor has the opportunity to weigh design and construction costs versus long term operating costs to achieve an ideal life cycle cost solution. VECPs may be submitted by the contractor for the purpose of enabling the contractor and owner to take advantage of potential cost savings from changes in the mandatory requirements applicable to the DB work, the O&M services, and/or other contract requirements. The contractor is encouraged to submit VECPs whenever it identifies potential savings or improvements. The owner may also request the contractor to develop and submit a specific VECP. The estimated net savings resulting from the VECP related to DB work and/or O&M services shall be split 50-50 between the contractor and the owner.

San Joaquin Hills Transportation Corridor Turnkey Tollroad

The experience of one highway project, the San Joaquin Hills Transportation Corridor in Orange County, California, is also relevant. This fixed-price DB project is being finance through bonds backed by toll revenues, FHWA and state letters of credit, contractor acceptance of toll revenue certificates in lieu of progress payments, and development impact fees. After receiving a low bid ($786 million present value) in excess of the project budget and allowing the contractor to advance certain non-construction activities, the owner and contractor negotiated various VE change orders with a total value of $34 million, of which the owner's share was over $20 million. The VE savings identified by the contractor were shared 50-50 with the owner, and saving due to reductions in the scope of work by the owner accrued to the owner. The contractor also agreed to accept $37.8 million of toll revenue certificates in lieu of progress payments, thus reducing the amount which had to be financed. A question remains whether the owner could have performed VE studies independent of the contractor and reaped all of the savings?

Quality Assurance/Quality Control

The turnkey projects examined are consistent in assigning QA and QC responsibilities to the contractor. This includes the CM function usually performed by the owner on conventional contracts. The contractor must prepare a Quality Program Plan for the owner's approval. The specifications for the Plan are defined in the contract documents which require conformance to the FTA QA/QC Guidelines and must include the work of all subcontractors. Thus, the prime contractor must include in its subcontracts those provisions which it considers necessary to assure that the quality of subcontracted work will be consistent with the prime contract requirements.

The owner's role becomes one of "quality oversight" of the activities of those entities which have been assigned responsibilities for QA and QC. Quality oversight verifies the turnkey contractor's execution of the Quality Plan and can include monitoring, audits and inspections conducted randomly or on a routine basis. The owner has the right to witness any QC test or inspection and has access to all test data including procedures, specifications and results. The owner has the right to conduct independent tests and inspections (at the owner's expense) of any material or equipment to be used on the project. The quality oversight responsibilities of the owner in no way relieves the contractor of its QA/QC obligations.

The contractor is required to assign qualified QA personnel in accordance with the contract's specifications. The contractor's QA manager is subject to the owner's approval.

Contractor Implementation Freedom

While contracts which combine design and construction responsibilities provide contractors with opportunities for integrating design and construction schedules to "fast track" the project, owners have controls in place which act to constrain the contractor's freedom to advance construction activities similar to the conventional construction contracts. These include the owner's notice to proceed; review and approval of certain contractor deliverable such as QA/QC plan, safety plan, accounting/cost control system; design reviews; possible interface with existing system operations; coordination with other contractors: and various other opportunities for owner reviews. BART, for instance, specifies that "only documents which have been approved by the District shall be used for execution of the work."

San Juan requires the occurrence of the following events, all of which must be satisfied, before a contractor can commence construction. They include:

- The notice to proceed from the owner.
- Approved of the baseline schedule and the quality assurance and control plan by the owner.
- Certification by contractor's design quality assurance manager that all conditions set forth in the approved design quality assurance and control plan have been met.

- That all governmental approvals have been obtained and conditions of such approvals that are prerequisite to commencement of such construction have been performed.

- All necessary rights of access have been obtained.

San Juan also permits the contractor to start construction of elements of the project prior to completion of final design subject to compliance with all applicable conditions as set forth in the approved design quality assurance and control plan. In the event contractor performs any such early construction, contractor shall be obligated at its own expense to correct any work not conforming to the final design documents.

OBSERVATIONS AND RECOMMENDATIONS

Value Engineering

Most grantees advancing transit turnkey projects attempted to follow the FTA VE requirements, but Baltimore sought and received a waiver, arguing that since the turnkey contractor is responsible for both design and construction, it has the financial incentive to achieve a cost-efficient design. But VE during the design stage has proven to be a valuable tool to identify potential cost saving features, with the cost savings of the accepted proposals almost always greatly exceeding the cost of performing the VE study.

VE studies should be conducted towards the end of PE, with sufficient time to consider proposed changes and incorporate them into the turnkey procurement package. If Baltimore had conducted a VE study prior to initiating the turnkey contract, they may have identified the proposal which was submitted by the contractor which was subsequently awarded half of the savings. The owner could also perform a VE study while the DB contractor is engaged, with any change accepted by the owner issued to the contractor as a change order.

The Baltimore situation raises the issue of incentives. A contractor has inherent incentives (and disincentives) based on the scope and extent of turnkey contract (DB, DBOM, BOT, Franchise see Section 6) and the nature of the pricing (fixed unit-price, fixed lump-sum prices, cost reimbursable). The owner only benefits from the contractor's incentives to the degree the contractor's costs to the owner are reduced. Thus, it is imperative that a high degree of competition be achieved when procuring turnkey contracts, either through competitive negotiation (RFP and evaluation of proposals) or formally advertised (IFB and low bid award).

Turnkey contractors have greater opportunity for creativity when working on an entirely new transit system (e.g., San Juan and New Jersey) as opposed to an extension to an existing system (e.g., Baltimore and BART). For a new system, the owner can provide more of a performance specification to which the contractor develops the detailed designs. For extensions to existing systems, the owner must constrain the turnkey contractor by providing very detailed designs and specifications which limits the contractors ability to achieve cost savings through innovative designs.

The turnkey contractor definitely should not be rewarded for recommending a VECP on its own design. VECPs must be limited to proposals challenging the owner-provided baseline designs, standards and specifications. The DB contractor definitely has the incentive to do VE-type studies on their designs, since they reap all of the benefits. The owner only benefits to the degree that there was intensive price competition at the procurement stage.

All grantees who permit VECPs provide rigid requirements for submission of contractor proposals. The review and processing of VECPs is very similar to change orders and the owner's organization should have the staffing to manage these functions. Given the investment on the contractors part to prepare and submit VECPs, it is unlikely that the owner would be overburdened by frivolous proposals. If numerous VECPs were submitted and accepted, it

would be an indication of weaknesses in the owners PE effort and could be embarrassing, since the shared VECP savings could have been fully captured earlier by the owner with more effective design reviews and VE studies.

In conclusion, VE studies during design and VECP provisions in construction contracts appear to be beneficial for both conventional and turnkey contracts. They are very low risk and potentially very high reward project management tools for transit capital improvement projects which can enhance the selected contractor procurement approach. Both design-phase VE proposals and construction-phase VECPs could be valuable sources of project cost reduction should implementation budgets become strained. The San Joaquin Hills Tollroad project only became financially viable after VE cost reductions were accepted.

Quality Assurance/Quality Control

In turnkey contracts, responsibilities for QA and QC are assigned to the contractor. The owner has an oversight role which consists of monitoring the contractor's adherence to its (owner approved) Quality Program Plan. The degree of owner audit and verification activities will depend on the confidence instilled by the contractor. The owner should be prepared initially to have a robust oversight program which can be relaxed if warranted by the contractor's performance. It may also be possible for the owner to provide financial incentives to encourage the contractor's quality performance, assuming that the owner's quality efforts (and costs) could be reduced.

Since the owner must continue to perform some CM functions in support of verification activities including construction progress and contractor payments, it is possible that the total cost of quality activities may not be reduced on turnkey contracts. The FTA's Turnkey Demonstration Program will evaluate both the quality related costs and total turnkey project costs, as well as many other project performance measures, and compare them with similar conventional projects.

Contractor Implementation Freedom

Transit turnkey contracts are designed to give contractors greater responsibility, authority and control, and owners expect time savings over the conventional approach, but these remain very public projects. This requires the owners to retain primary responsibility for dealing with the general public and with public agencies in matters such as funding, environmental compliance, right-of-way acquisition, general agreements, community relations and other issues of interest to the owner agency's policy board. Therefore, unlike a strictly private undertaking, transit turnkey contracts are limited in their freedom to independently advance implementation activities. Good planning on the owner's part should result in giving as much freedom as possible to contractors to achieve the owner's time, cost and other project objectives motivated by the profit incentive. The owner should strive to meet its commitments for provision of project resources and reviews/ approvals so as not to constrain the contractor's efforts.

PART V

TRANSIT TURNKEY PROCUREMENT LESSONS LEARNED

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TRANSIT TURNKEY PROCUREMENT
LESSONS LEARNED

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PREFACE

Evidence indicates that Turnkey is a viable option for the present and the future in planning, designing, building and operating portions of, or entirely new transit systems, extensions to existing ones, and modernization to existing facilities. Dwindling dollars at all government levels, changes in the workplace arrangement and right-sizing, and issues relating to civil rights, have made the Federal Transit Administration rethink how it impacts the way business is conducted in the United States.

Traditional methods where design, construction and operation bids are let on a "piecemeal basis" are predictably time consuming, and more costly. The entire industry is realizing and admitting that perhaps the way that transit has been developed in the last fit to one hundred years or so, can no longer continue. At this juncture, the very best experiences and practices currently implemented, should now be considered in establishing new procurement policy, even if that means turnkey and other innovative models and methods that work. More effectively however, as public contracting practices are being constantly reengineered, fairness and equity for small and minority contractors are becoming evident and in need of being preserved.

The objective of this discussion paper is to, first describe the Federal and State laws, regulations and mandates that affect the turnkey approach to transit delivery. Secondly, the report will present the current practices being utilized in procuring transit developments through a turnkey approach through FTA's Turnkey Demonstration Program. Specifically, the paper will bring forth variations that turnkey method provides over conventional procurement. The intent is to show the differences that exist, and where turnkey alternative can provide a more effective approach during acquisition planning and contract procurement. Beginning with prequalifications wherever State laws allow, and transitioning through invitation for bids, industry review and competitive negotiation vs. formally advertised procurement, it seems that the turnkey approach provides benefits in time and cost savings. Additionally, turnkey approaches presents unique capabilities in critical areas of risk management, including innovative scenarios and opportunities in funding and financing, teaming, partnering and joint venturing, risk sharing, change orders and dispute resolution, insurance and bonding requirements. Thirdly, the next chapter will discuss issues of subcontracting, which in itself has become and important topic. This chapter will address the key areas of third party contracting, as it relates to the utilization of small, disadvantaged, minority and women business enterprises in achieving an environment of full, open and fair competition as prescribed by the Common Grant Rule and FTA's Circular 4220.1D.

INTRODUCTION

This chapter describes the background of various legislation that has been passed, both on the federal and state level, allowing design/build or turnkey, as a procurement method.

Federal and State Legislation

Intermodal Surface Transportation Efficiency Act

The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, authorized a demonstration of the turnkey procurement method for the development of major transit projects. ISTEA directed the Federal Transit Administration (FTA) to select two or more transit projects, in order to determine the degree to which turnkey procurement approaches advances new technology, saves time and reduces the cost of transit system implementation. Accordingly, two more approved transit projects would participate in the National Turnkey Demonstration Program, in order to demonstrate the effectiveness of the turnkey procurement method.

Turnkey Demonstration Program (TDP)

The FTA developed the Turnkey Demonstration Program with the advertisement and selection of projects for inclusion as part of this program. Four projects are participating in the program which include: Baltimore Light Rail Extension; Bay Area Rapid Transit (BART); District's San Francisco International Airport Extension; Los Angeles Union Station Gateway; and San Juan's Tren Urbano. In addition, the Hudson-Bergen Light Rail Project, similarly a turnkey project, has also been interacting with the TDP process.

The FTA has begun a series of industry roundtable discussions and expert forums/workshops, designed to bring interested parties together so as to collect state-of-the-art information on the process, and to disseminate initial findings on the progress of these Turnkey Projects. Such workshops have been held in March and November of 1994 in Washington, D.C., and in May of 1995 in Los Angeles, California, and lastly in October of 1996 in San Juan, Puerto Rico. It has become evident from the testimony from these workshops, that the implementation of the national TDP has presented numerous issues, breakthroughs and advantages in the procurement of professional services, as well as for construction contracts when implementing transit infrastructure projects. These include new starts, extensions, and rehabilitation of existing transit systems throughout The United States.

As mentioned above, several TDP workshops have been undertaken in an attempt to define and clarify the key planning issues in comparing cost and schedule analysis of the turnkey projects, vis-à-vis conventionally procured projects. As part of Section 3019 of ISTEA, the FTA is responsible for reporting to Congress on the progress of the demonstration program, and in determining the degree to which the turnkey procurement approach can reduce the project implementation time schedule, and lower the cost of transit capital project development. In so doing, the FTA wishes to measure the effects that TDP projects may have on the:

- effectiveness of construction and acquisition scheduling;
- increase in private sector financial participation;
- improvement of flow of funds;
- diversification of all aspects of project risk;
- enhancement of contract procurement and management;
- reduction on the cost of transit system development, operation and maintenance.

Federal Acquisition Reform Act (FARA)

In 1996, President Clinton signed a new legislation known as FARA which gives federal governmental agencies broad abilities to consider design/build as a project delivery strategy or option. According to the July 1996 Civil Engineering Magazine, the new "two-phase" design/build approach is anticipated to provide more meaningful pre-qualifications or short-listing for teams offering proposals to federal agencies. Section 4105 stipulates the criteria for determining whether or not a project may be appropriate for design/build based on:

- adequate project definition
- time lines for project delivery
- potential contractor experience and capability
- suitability of project for two-phase selection process
- capability of the transit agency to manage the two-phase selection process
- other criteria established by the transit agency

Senate Bill 1124

On the 10th of February, 1996, President Clinton signed into law S 1124, which deals with design/build. It represents the first significant modification, in procuring A/E design services by the federal government, since the passage of the Brooks Architect-Engineers Act in 1972. The bill set out strict procedures for the agencies to follow, when they decided to enter into a design/build project. The bill also created a two-phase process for the selection of design/build contractors. It required an agency that plans to employ the design/build method, to use only the two-phase selection process, based on the following five key determinants:

- extent to which the project requirements have been adequately addressed;
- schedule for completing the project;
- capability and experience of potential contractors;
- suitability of the project for the two-phase selection procedure;
- capability of the agency to manage the two-phase selection process;

There seems to be a move to bridge federal laws regarding design/build approaches to procurement of transit systems, as well as other types of large capital intensive projects. Recently the Federal Register/ Vol. 61, No. 153, Wednesday August 7, 1996 issue, published proposed rules to the Department of Defense (DOD), General Services Administration (GSA),

and the National Aeronautics and Space Administration (NASA) procedures authorizing the use of design/build as appropriate methods when contracting for construction, including a two-phase process.

These changes affect 48 CFR Part 1 (Federal Acquisition Regulations System), Part 5 (Publicizing Contract Actions), Part 14 (Sealed Bidding), and 36 (Construction and Architect-Engineer Contracts).

Various organizations - i.e., Design/Build Institute of America, American Civil Engineering Council, the American Society of Consulting Engineers, the American Institute of Architects, and the Associated General Contractors of America, are all working to assist the government in drafting such regulation related to the aforementioned issues to implement the new law. These various groups seek, in part, to draft and promote regulations that:

- adhere to the letter and spirit of FARA;
- ensure the contract results in the best value to the government;
- stress the importance of the offeror's qualifications in selection of the design/build entity;
- use straightforward, common sense language in the regulations;

FTA Circular 4220.1D Third Party Contracting Rules

The FTA Circular sets the requirements a grantee must adhere to in the solicitation, award and administration of its third party contracts. These requirements are based on the Common Grant Rule, Federal statutes, Executive Orders. Accordingly, procurements are to be conducted in a manner providing:

1. Full and open competition;
2. Prohibition against geographic preferences;
3. Pre-qualification criteria which insures that enough qualified sources are included to insure maximum full and open competition.

State Legislation

A survey recently completed by the law offices of Nossaman, Guthner, Knox & Elliott (NGKE) has identified a complete state-by-state analysis of legislation authorizing design/build procurement in a variety of fields, including transportation and transit. The trend to allow design/build in services and construction procurement, has been steadily increasing recently.

To date, less than half the states have passed legislation, which to some degree, identify, support or encourage turnkey approach to undertaking public projects, as shown in Exhibit 1-1(a).

According to NGKE's document on ***"50 State Survey of Public Agency Design-build Authority"***, support for design/build process is mounting. States are exploiting turnkey opportunities by updating procurement legislation that promotes design/build. However, as of

September 1996, only twenty-nine (29) states have "unclear" or "no position" on design/build legislation for transportation related projects. Many of the 21 states which now have legislation, enacted supporting laws allowing design/build, have only done so in the last three to five years.

Exhibit 1.1(a). Fifty State Survey of Design/Build

STATE	AUTHORITY/JURISDICTION	POSITION ON DESIGN/BUILD
Alabama	State/County/Local	Unclear
Alaska	All agencies for projects using state funds, subject to determination by Chief Procurement Officer	Yes
Arizona	State Transportation Board	Yes
	Department of Transportation	Yes
	Other State and Local Agencies	Problematic
Arkansas	State Agencies and Political Subdivisions	Problematic
California	CalTrans	Yes
	BART	Yes
	West Bay Rapid Transit Authority	Yes
	Los Angeles MTA	Yes
Colorado	Department of Transportation (Public-Private Partnerships)	Yes
Connecticut	State	In general, problematic with exceptions
Delaware	State	Unclear
District of Columbia	District	Problematic
Florida	State: subject to Consultants Competitive Negotiation Act	Yes
Georgia	Highway Authority	Yes
Hawaii	Honolulu Transit Authority	Yes
Idaho	Other agencies	Problematic
Illinois	State	Problematic
Indiana	State/local Administrations	No
Iowa	Transportation	Unclear
Kansas	Turnpike Authority	Yes
Kentucky	Department of Transportation	Problematic
Louisiana	State agencies	Problematic
Maine	State	Unclear
Maryland	Capital Projects	Yes
Massachusetts	Capital facility projects	Yes
Michigan	Highways and motor vehicles	Unclear
Minnesota	State highways and local transportation	Unclear
	Metropolitan Transit (light rail systems)	Yes
Mississippi	State/local	Problematic
Missouri	State	Problematic
Montana	Department of Transportation	Yes
Nebraska	State/Counties	Problematic/Unclear
Nevada	State Public Works Board	Yes
New Hampshire	Capital Budget Projects	Yes
New Jersey	Transit	Yes
New Mexico	All other agencies	Unclear
New York	Metropolitan Transportation Authority	Unclear
	New York Transit Authority	Unclear
North Carolina	Department of Transportation "CARAT" System	Yes
North Dakota	State	Problematic
Ohio	State	Problematic
Oklahoma	All state and local agencies	No
Oregon	Department of Transportation	Yes
Pennsylvania	State	Problematic
Rhode Island	State	Unclear
South Carolina	Department of Transportation	
South Dakota	Public Works	No
Tennessee	Transportation	Unclear
Texas	High-Speed Rail Authority	Yes
Utah	All agencies	Yes
Vermont	State	Unclear
Virginia	All state agencies; various local agencies	Yes
Washington	Department of Transportation: (Public/Private Authority)	Yes
West Virginia	State/local/county	Problematic
Wisconsin	State	Yes
Wyoming	Department of Transportation, cities and towns, county bridge projects	Problematic
Puerto Rico	Department of Transportation	Yes

Source: The law firm of Nossaman, Guthner, Knox & Elliott, Los Angeles, CA September 1996

Source: Nossaman, Guthner, Knox & Elliott

A more detailed assessment of the states was presented at the American Bar Association 20th Anniversary Meeting held during May 1-4, 1996 in Dallas, Texas, by focusing a Forum on the Construction Industry. The authors also conducted a survey of state-by-state procurement laws as it relates to design/build entitled ***"The Design-build Cookbook - the Design-build Projects vs. State Licensing and Public Procurement: A Road Map to Success"***. The survey raised seven specific questions relative to a hypothetical client who wishes to pursue design/build projects for private and for non-federal public projects. The survey identified seven issues listed below, and summarized in the matrices shown on Exhibit 1-1(b) and 1.1 (c) on the following pages, range from licensing of design professionals, to licensing of contractors, to restrictions on professional practice by corporations, to awarding of public projects to the lowest bidder. The questionnaire included:

1. Can a professional design corporation, organized and licensed in accordance with relevant state, laws, perform design/build work with its own forces under a direct contract with an owner?
2. Can a general contractor, organized and licensed in accordance with relevant state laws, perform design/build work with its own forces under a direct contract with an owner?
3. Can an engineering constructor, such as the company outlined in our hypothetical, which is organized and licensed in accordance with relevant state laws, perform design/build work with its own forces under a direct contract with an owner?
4. Is a design firm which does not hold a contractor's license, permitted to enter into a design/build contract with an owner and subcontract the construction work to a general contractor?
5. Is a general contractor, which is not licensed to practice architecture or engineering, permitted to enter into a design/build contract with an owner and subcontract the design work to a design firm?
6. Are design firms and general contractors permitted to form joint venture to perform design/build work?
7. Are public owners authorized to utilize the design/build method of project delivery?

According to the paper presented to the American Bar Association, there are only approximately ten of the fifty states, and the District of Columbia, that answer each of the seven questions affirmatively on true design/build permissibility. A comprehensive state-by-state comparison relating to each of the above seven questions is shown in Appendix A.

	Q1: Professional Design Corp. & Design/Build Work with its Own Forces	Q2: General Contractor and Design/Build Work with its Own Forces	Q3: Engineering Constructor and Design/Build Work with its Own Forces	Q4: Design Firm and Design/ Build Work, by Subcontracting the Construction Work	Q5: General Contractor & Design/Build Work, by Subcontracting Design Work	Q6: Design Firm/General Contracting Joint Ventures and Design/Build Work	Q7: Public Owner's Authority to Utilize Design/Build Project Delivery
Alabama	○	○	○	○	○	●	●
Alaska	●	○	○	○	○	○	○
Arizona	●	○	○	●	○	○	●
Arkansas	○	○	○	○	●	○	●
California	●	○	○	●	●	○	□
Colorado	○	○	○	○	○	○	○
Connecticut	○	○	○	○	○	○	●
Delaware	○	○	○	○	○	○	○
District of Columbia	○	○	○	○	●	○	●
Florida	○	○	○	○	○	○	○
Georgia	●	○	○	○	○	○	□
Hawaii	●	○	○	○	○	○	○
Idaho	○	●	○	□	○	○	○
Illinois	○	●	○	○	●	○	○
Indiana	○	○	○	○	○	○	●
Iowa	●	●	●	●	●	○	●
Kansas	○	○	○	○	○	○	●
Kentucky	○	○	○	○	○	○	○
Louisiana	○	●	●	○	○	○	●
Maine	○	○	○	○	○	●	●
Maryland	○	○	●	○	●	○	○
Massachusetts	●	○	○	○	○	○	●
Michigan	○	○	○	○	○	○	○
Minnesota	●	○	●	○	●	●	●
Mississippi	○	○	●	○	○	○	●

○ Yes
● No
● Unclear

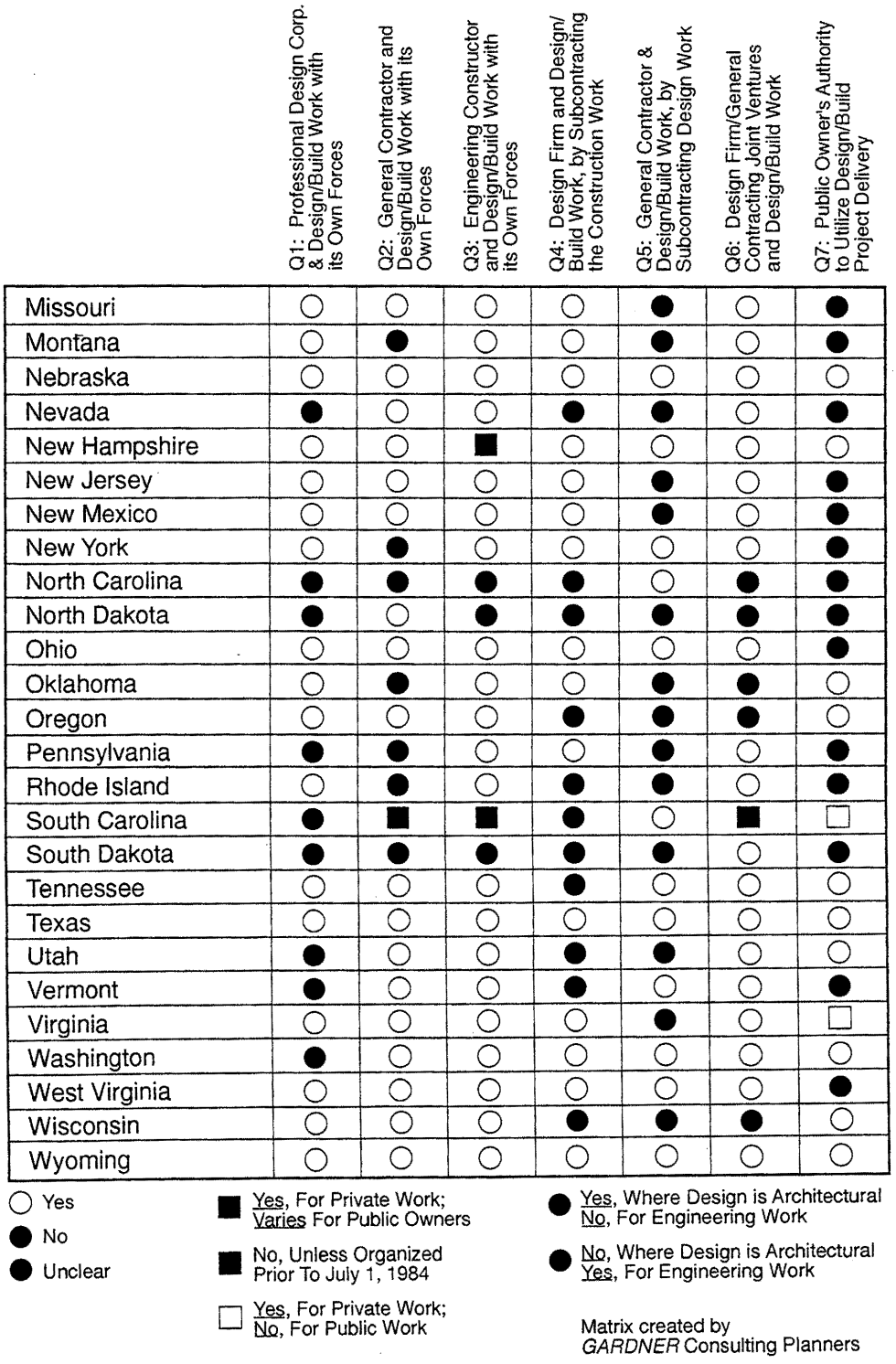
■ Yes, For Private Work; Varies For Public Owners
■ No, Unless Organized Prior To July 1, 1984
□ Yes, For Private Work; No, For Public Work

● Yes, Where Design is Architectural No, For Engineering Work
● No, Where Design is Architectural Yes, For Engineering Work

Matrix created by *GARDNER* Consulting Planners

source: *The Design/Build Cookbook*
The American Bar Association Forum on the Construction Industry

Exhibit 1-1(b). Fifty State Survey for Design/Build



source: *The Design/Build Cookbook*
The American Bar Association Forum on the Construction Industry

Exhibit 1-1(c). Fifty State Survey for Design/Build

Exemptions, Waivers, Special Legislation for Design/Build in TDP Projects

There is a need to receive exemptions, waivers and the enactment of special legislation in order to provide for turnkey method of transit delivery. The current round of Turnkey Demonstration Program projects had to carefully maneuver around a variety of Federal and State laws in order to receive authority to accomplish goals of a turnkey delivery system. These include:

CALIFORNIA

BART: The Bay Area Rapid Transit District (BART) sought and obtained special State legislation codified as California Public Contract Code 20221.1. Under this statute, BART could proceed, using a request for qualifications which identifies the minimum standards that the District had determined should be met, or exceeded by a contractor to successfully design/build the San Francisco Airport extension project. A minimum of three firms would be pre-qualified for the District to proceed to bid stage. Only those three firms which had been pre-qualified were eligible for award of a contract. The statute allows pre-qualification (an area of particular concern to BART, since they were previously involved in litigation concerning pre-qualification), and requires that the project be awarded to the low-bidder. This request was then forwarded for approval through the FTA Office of Procurement and the Administrator, to the U.S. DOT Assistant Secretary for Administration in Washington D.C. The Office of Small and Disadvantaged Business was called upon, to ensure that there was no adverse impact on the small and disadvantaged program.

BART sent a request for a one-time exemption from the pre-qualification requirements of 49 CFR 18.36 (c) (4) to the Regional Administrator of FTA Region 9 Office. In its letter, BART stated that it placed advertisements for the pre-qualification in major national and state publications, sent advanced notices of the pre-qualification documents to over 1000 firms, including all organizations that contributed to, or inquired about design/build industry review, and were identified in the District's design/build database. This effort is consistent with FTA C 4220.1D (8) (d), which states that "grantees shall ensure that all lists of pre-qualified persons, firms, or products that are used in acquiring goods and services, are current and include enough qualified sources to ensure maximum full and open competition.

LOS ANGELES COUNTY MTA: The Los Angeles Union Station Gateway was accomplished through the California Public Utilities Code Section 130242 (SB 616) which allows for turnkey projects to be competitively bid. SB 616 was conceived as authorization allowing 'bundling' of different types of work, in order to allow a true turnkey project. The legislature limited its usefulness, by requiring competitive bidding to be used. California Public Utilities Code Section 130238 has been in place for a number of years and it allows competitive negotiation of specialized transit equipment.

MARYLAND

MARYLAND MTA: Baltimore's Light Rail Extension was awarded using a two-step process, with pre-qualifications, followed by competitive bidding. No special legislation was enacted, and the process followed the requirements of State Procurement Regulations COMAR 21.05.02.17.

NEW JERSEY

NEW JERSEY TRANSIT: The New Jersey Transit's Hudson-Bergen Line turnkey procurement did not receive any special legislation, since the State procurement laws permitted design/build process.

PUERTO RICO

PUERTO RICO ACT: The San Juan Tren Urbano project is being accomplished by an existing Puerto Rico law. An addendum amendment authorizes turnkey delivery of transportation projects in general.

San Juan sent a request for waiver of the 100% bonding requirement to the regional Administrator of FTA Region 4 Office, and then forwarded to the FTA Office of Procurement in Washington D.C. In its initial letter, the grantee stated that the surety market could not provide 100% bonding, but only 50%. FTA in its initial response back to San Juan, requested more information, specifically:

1. A description of the process employed to evaluate proposals.
2. A summary of the successful bidding teams, including criteria such as financial capacity, technical merit, backlog of projects, and transit experience.

Once this information was received by the Office of Procurement, an approval was given. In its approval, the FTA took the position that this did not constitute a waiver, because the bonding requirements set forth in the Common Grant Rules and FTA C4220.1D apply to construction and not to turnkey procurements. It noted that since this was not a departure from the minimum standards set-forth in the Common Grant Rules, it was not necessary to process a request for waiver through the FTA Administrator and the Office of the Secretary. However, since it was precedent setting and involved the turnkey program, FTA was exercising it rights to review and concur, or non-concur, in a matter that was of special interest to FTA. This is consistent with Section 5 (a) (b) of FTA C 4220.1D.

TURNKEY PROCUREMENT STRATEGIES AND ISSUES

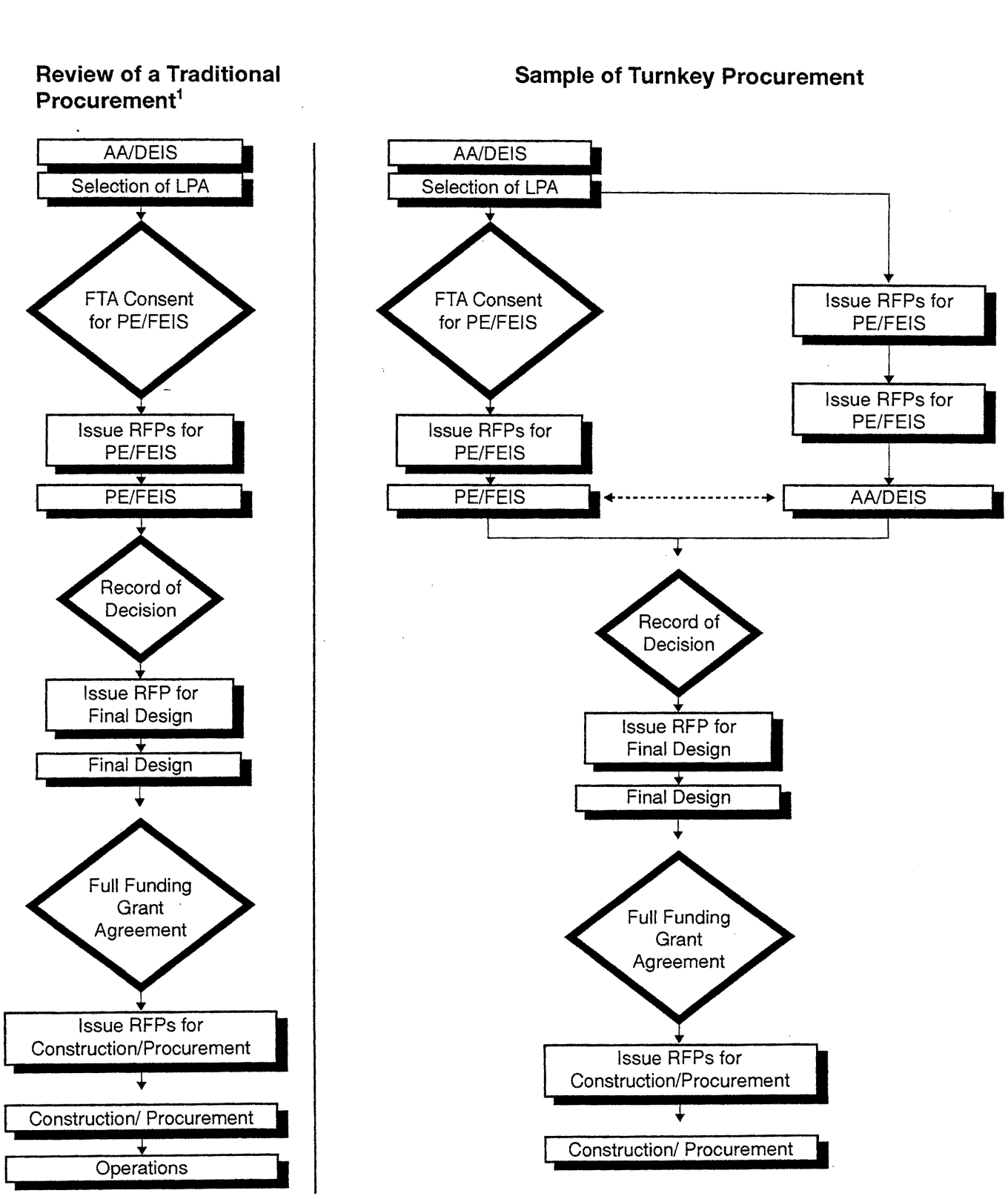
Use of turnkey method procurement, is growing in the development of mass transit fixed-guideway projects outside North America. On the international scene, recent examples of major transit turnkey rail projects have occurred in London, (UK); Athens, (Greece); Ankara, (Turkey); and Hong Kong. Given the differences between institutional settings in these nations, and those found in the U.S., the foreign turnkey experiences however, may not be directly transferable to the U.S. environment. For example, most other nations do not possess well-developed, tax-exempt municipal bond markets, thus allowing the system contractor responsibility for project financing. Furthermore, sponsoring agencies in foreign countries like Hong Kong, generally have greater control over land-use development matters than their U.S. counterparts, thus facilitating public/private partnerships for the development of fixed-guideway systems and the surrounding land. Finally, the combination of design and construction disciplines within a single private entity, tends to be fairly prevalent practice in many countries, but relatively new in the U.S. Nonetheless, these exact issues can come into play in FTA's turnkey projects in areas of project dealing with acquisition planning and construction procurement.

Innovative Turnkey Strategies In Transit Development

North America and the United States Experience - Currently, the North American experience with turnkey method procurement for developing fixed-guideway projects, is limited and has demonstrated mixed results. Completed projects include Detroit's Downtown People Mover, Miami's Metro Mover, Vancouver's Skytrain, and Toronto's Scarborough Rapid Transit Extension. The development of the Houston Fixed-guideway Project and the Honolulu Rapid Transit Project, were terminated prematurely prior to commencement of construction phase.

Current U.S. transit turnkey projects include those projects that have been incorporated in the FTA's TDP as part of the ISTEA mandate. As stated earlier, four projects are participating in this program which include Maryland MTA's Baltimore Light Rail Extension, Bay Area Rapid Transit (BART's) San Francisco Airport Extension, the Los Angeles County MTA's Union Station Gateway Intermodal Transit Center, and Puerto Rico Department of Transportation's San Juan Tren Urbano. Recently, the New Jersey Department of Transportation that oversees the statewide New Jersey Transit Corporation, has initiated a turnkey project for Hudson-Bergen Light Rail Line, which will also be participating in FTA's Turnkey Demonstration Program.

Innovative Procurement Methods - Innovative procurement techniques are typically used for construction of automated fixed-guideway transit systems. Suppliers of such specific systems, are usually contracted for design, construction or design/build (turnkey), and possibly operations and maintenance. Alternatives to the traditional method as shown in Exhibit 2-1 on the following page, are described as turnkey variations, which satisfy the same functional requirement. They might include functions carried out by the turnkey vendor or contractor, instead of governmental agencies, in relation to the number of checkpoints/sign-off encountered



[1] source: Evaluation of Houston's Turnkey Experience

Exhibit 2-1. Review of a Traditional Sample of Turnkey Procurement[1]

[1] source: Evaluation of Houston's Turnkey Experience

along each branch, the level and nature of public oversight required, the allocation of risk under traditional versus turnkey approach. This in turn can be translated into such measures as the size of the staff needed, the time required to complete each functional task, and the value or cost of the risk burden that has been reduced or allocated.

Under a typical turnkey procurement, a transit agency contracts with a single private entity, the turnkey contractor, for design, construction and delivery of a complete and operational project. The turnkey contractor is typically composed of a consortium of firms with the necessary skills to design and build a fixed-guideway system, including equipment manufacturers, architectural and/or engineering design firms, construction contractors, and many supporting elements. Depending on the scope of the turnkey contract, the consortium may also include others with specialties not ordinarily associated with the transit system development. For example, if the contract provides joint development opportunities, - i.e., station concessions or the development of lands adjacent to the system, then the consortium team might include a real estate developer, or if project financing is included, the team might include investment banking firms.

Types of Turnkey Contracting Approaches

A large number of turnkey variations are possible, depending of course on the starting point in the process of transit development. A barrage of terms have crept in our vocabulary, characterizing the difference among various turnkey strategies that could be pursued in procuring transit development, which include:

- **Turnkey** - A prototypical single design/build strategy is to specify a desired end for a system. A public agency contracts with a private entity for delivery of a complete and operational project that will be eventually publicly-owned. The contractor, or developer, is given overall responsibility for project implementation, including design and construction. After certification of project completion, the developer "turns the use. Either the owner, the turnkey contractor, or a third party could have responsibility for operations and maintenance.

- **Full Turnkey - Build-Operate-Transfer (BOT)** A private entity is given authority to design, build, own, and operate a facility for a period of time, after which the title reverts over to the public sector.

- **Full Turnkey - Build-Transfer-Operate (BTO)** - A variation of BOT described above, which allows private entities to reduce their liability exposure. After designing and financing, and construction, ownership is transferred to a public agency. Provisions may be included that allows the builder to have an exclusive to operate the project over a set given time.

- **Modified Turnkey** - Under this variation of the turnkey method, the turnkey contractor assumes responsibility for the completion of all aspects of project development with the exception of the construction of fixed facilities (such as

stations, subway tunnels, and maintenance facilities). Hence, while the turnkey contractor may still be responsible for the design and construction management of fixed facilities, the actual construction of these facilities occurs outside of the turnkey contract (i.e., with one or more independent civil construction contractors). The Houston fixed guideway project is an example of a modified turnkey.

- **Separate or Combined Civil / Systems Turnkey** - Civil only construction projects, mainly fixed facilities such as engineering works, military buildings, prisons, are probably the easiest and most successful types of projects to acquire using turnkey methods. Adding or integrating electronic and computer systems, increases the challenge as to the breadth of skills required by the turnkey contractor and the owner.

    - Los Angeles' Union Station Gateway turnkey project for its intermodal transit center and headquarters building involved a single design/build civil contract.
    - Baltimore's light rail extension is single design/build civil and systems combined contract.
    - BART's San Francisco Airport extension of its system on the other hand, is multiple design/build civil and systems combined contract.
    - San Juan's Tren Urbano project can be characterized as a single design/build, civil and systems combined contracts plus vehicles.

- **Super Turnkey** - In addition to the provisions of turnkey projects mentioned above, the private entity receives real estate development rights along the project right-of-way, at stations areas, and potentially at off corridor locations. In exchange for these rights, the super turnkey contractor is expected to provide partial project funding, thus reducing the need for public investment. Examples of these are the Honolulu and Houston turnkey rail projects, as well as those that are currently being utilized in Honk Kong and other parts of Asia.

Many of these turnkey variations are depicted in Exhibit 2-2 on the following page, along with the key project responsibilities of both the sponsoring transit agency, or owner, and of those entities who contract with that agency for various aspects of project development under turnkey method procurement.

Benefits of Turnkey Approaches

The most obvious difference that turnkey approach has from the traditional approach, lies in the ability of the owner to benefit from a number of areas as listed below and shown in Exhibit 2-3 on the following page.

- Clearer project definition
- Reduction in the number of contracting entities
- Reassigning of roles/responsibilities to the turnkey contractor
- Consolidation of most project responsibilities under a single point

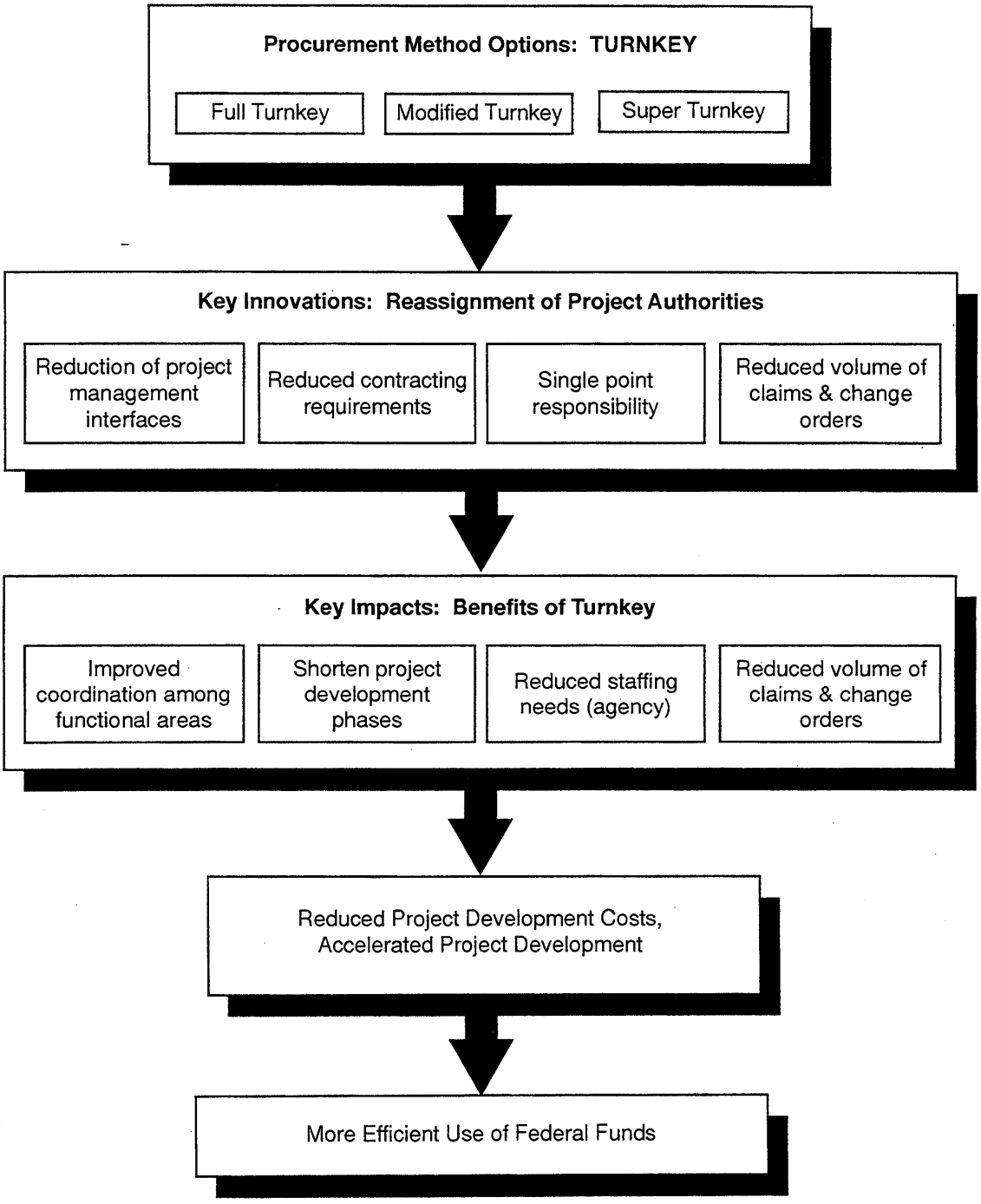
- Reduction in management interfaces for multiple contracts
- Overlap or improved coordination of functional areas/tasks performed
- Shortened project development cycles leading to compacting of schedule
- Reduction of staffing resources required for project management
- Lower volume and costs of contract claims and change order processing
- Reduced risks, insurance and bonding requirement

	Alternatives Analysis	Preliminary Engineering	Final Design	ROW/ Utilities	Const. Guideway	Const. Fixed Facil.	Systems	Start-up & Testing	Operations & Maint.	Funding/ Financing
Traditional Method										
Agency	●	◒	◒	●	◒	◒	◒	●	●	●
Design Consultant		●	●	○	○	○	○	○		
Systems Consultant			●	○	○		○	○		
Systems Supplier					○		●	○		
Civil Contractor(s)					●	●				
Full Turnkey (BTO)										
Agency	●	●	◔	●	◔	◔	◔	◔	●	●
Gen. Design Cons.		○	○	○	○	○	○	○		
Turnkey Contractor		○	●		●	●	●	●		
Full Turnkey (BOT)										
Agency	●	●	◔	●	◔	◔	◔	◔	◔	●
Gen. Design Cons.		○	○	○	○	○	○	○	○	
Turnkey Contractor		○	●		●	●	●	●	●	
Modified Turnkey										
Agency	●	●	◔	●	◔	◔	◔	◔	◔	●
Gen. Design Cons.		○	○	○	○	○	○	○	○	
Turnkey Contractor		○	●		●	◒	●	●	●	
Civil Contractor						●				
Superturnkey										
Agency	○	●	◔	●	◔	◔	◔	◔	◔	●
Gen. Design Cons.		○	○	○	○	○	○	○	○	
Turnkey Contractor	●	○	●		●	◔	●	●	●	◒

Legend: ● Primary responsibility; ◒ Secondary / management responsibility; ◔ Oversight responsibility; ○ Supporting responsibility

source: Evaluation of Houston's Turnkey Experience

Exhibit 2-2. Public Agency Role in Different Types of Turnkey Contracts



[2] source: Evaluation of Houston's Turnkey Experience

Exhibit 2-3. Anticipated Turnkey Process Benefits[2]

Turnkey Procurement Issues

An evolutionary trend is emerging throughout the public transit community, with respect to cost effective and schedule saving measures, to secure transit systems development. Up to the mid 1990's, information has been presented on the "first layer" regarding how actual contract procurement experiences in the FTA Turnkey projects have succeeded, failed, or are in need of modification. Turnkey procurements are presently being viewed as both politically expedient and professionally practical, from the standpoint of making good business sense, with full backing from the national design/build industry and the local community at large. Public transit agencies which have in the past required "low bid", are in sharp contrast with the private sector procurement process, which may base its decision on price and other factors such as quality. The contracting community routinely does not embrace the concept of "negotiated procurement". The traditional manner of doing business in the transit industry is performed on a "piecemeal" basis, (i.e., plan bid, design bid, systems bid, construction bid and operations bid) which leaves a great deal to be desired. A singular turnkey contract which decreases the risk of the transit agency, yet allowing flexibility and innovation on the part of the established Turnkey partnership, on the other hand go a long way in addressing current concerns for transit procurement.

Selection of turnkey method is not likely to be appropriate, or a panacea, for all new start transit projects. Hence before moving to the turnkey procurement approach, sponsoring agencies should consider the following questions or issues during acquisition planning:

- Unique characteristics of the project under consideration
- Agency's previous experiences and ability relating to major capital investments
- Benefits the agency wishes to obtain - i.e., schedule and/ or cost savings

Acquisition Planning

Some would argue that acquisition planning is the same, whether turnkey or conventional procurement. This is true in the general sense that acquisition planning efforts - that is the process by which all personnel and activities responsible for an acquisition - are well coordinated and integrated through a comprehensive planning process where real planning is done in advance. However, when one considers the timing, responsibilities, risks, number of contracts, procurement strategies and other factors in conventional versus turnkey approach procurement, then the true meaning of acquisition planning takes on an entirely different focus and importance.

In the conventional approach to the design, procurement and construction of a transit project, the owner assumes responsibility of the design, system integration, procurement of construction and management interface, as well as quality control and phasing of the entire project. Therefore, acquisition planning is somewhat a phased activity. For example, early planning involves obtaining the services of a General Engineering Consultant (GEC), who may provide design,

systems integration, technology selection or other management of the project for which the owner may not have the capacity to accomplish.

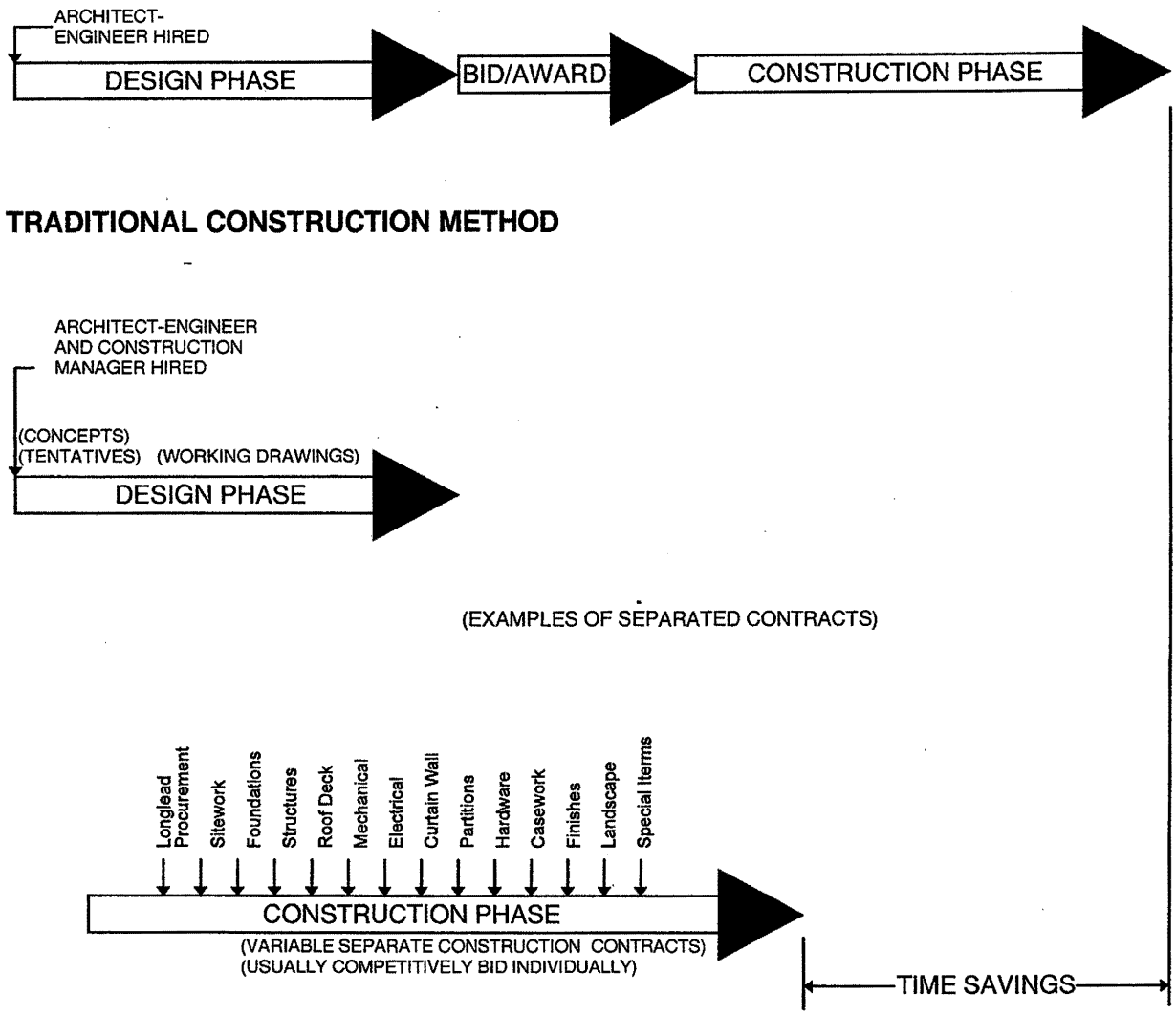
In the full turnkey approach, the turnkey contractor will have the responsibility for the full gamut from preliminary engineering, design, systems integration, construction and testing for start-up, and possible operation of the system. Therefore, the acquisition planning phase of the project under turnkey procurement entails a more concentrated, detailed and long range planning effort, and very little phasing of the individual elements. Whether the risk and responsibility rests with the owner or the contractor, the planning by the owner must take into consideration, at least the following:

1. Funding;
2. Political - ranging from the Federal, State, local community groups. Aside from the political aspects of the funding, the acquisition of rights of way and real estate are major hurdles in some cases;
3. Impact on utility or city infrastructure;
4. Inflation;
5. Federal requirements;
6. Procurement strategy and contractor selection.

Elements to Consider During Acquisiton Planning

Sponsoring Agency's Experience and Resources: Whether the sponsoring agency possesses the required experienced and resources, is key in determining whether or not to pursue design/build. If the sponsoring agency has had little or no previous experience with guideway development, or if the proposal features a highly sophisticated system technology, or the agency lacks the human resources required to complete the effort, then the benefits of turnkey procurement may be the optimum, and will include time and cost benefits. In those instances where the agency has previous experience in design-build, and operation of fixed-guideways, it may not be as beneficial to enter into a turnkey contract for the purpose of extending existing lines using the same technology, such as the case of Baltimore's Light Rail Extension and BART's San Francisco Airport Extension. In this instance, the benefits are mainly driven by schedule-based savings, as shown in Exhibit 2-4 on the following page, since the agency's knowledge of the system development in the local market, may equal that of the turnkey contractor.

Agency Concern Over Costs: The concern by an agency regarding project costs, may sometime dictate that a fixed-price cost estimate from a turnkey contractor, is more valuable than the traditional contracting method with its increased oversight and project control. Under a turnkey method, the agency may benefit from the commitment of a fixed project cost estimate (within a pre-selected inflation cost index). On the other hand, turnkey approach lessens the level of direct public agency involvement, and ability to modify project definition within the development process, unless such matters are brought into the oversight process and project management interface.



Source: Turnkey Evaluation Guidelines, Volpe National Transportation System Center.

Exhibit 2-4. Traditional versus Turnkey Design and Construction Scheduling

System Cost Exceeded - A system's cost estimates will likely be exceeded if system configuration is not sufficiently specified prior to selection of the system supplier. Also, contingency components in proposal bids will reflect design uncertainties, as well as additional change orders as system configuration is refined. Bidding for the construction of fixed facilities should not take place, until after the preliminary engineering process (at least 10 - 20% of the engineering design effort) has been completed, thus leading to a clearer project definition. This limits the uncertainty associated with ill-defined project design, and can lead to lower construction bids, and a lower overall cost of system completion. Such a process change will also ensure that project construction costs, do not unnecessarily complicate the choice of the preferred turnkey contractor. For example, on the Houston Fixed-guideway Project, the system supplier selection process was concluded prior to the initiation of Preliminary Engineering.

Tight Project Schedule - In the event that a project's development schedule is tightly compressed, then a turnkey procurement might offer the agency the best chance for achieving its operational deadline. As noted earlier, turnkey method shows significant promise as a means of compressing the development period for major transit capital investment projects. For example, the Los Angeles County Metropolitan Transportation Authority (LACMTA) was under a deadline to complete a $295 million agency headquarters and a major intermodal center. This urgency was due to the fact that LACMTA had to relocate its personnel from its existing facilities, prior to their lease expiration so as to avoid substantial financial penalties. Additionally, the agency had to complete Union Station Gateway intermodal facility, to coincide with the easterly terminus of the Red Line fixed-guideway system when it started its operation.

Decision as to the Physical Scope of the Turnkey Contract - As much as possible, the separation of the civil construction from the turnkey contract, or separation of the civil and systems efforts from the turnkey contract should be pursued. This could allow for the construction contracts to meet the low-bid requirements of certain state statutes. It will also lessens the development of a turnkey consortia or team, which might contain members with inherently differing perceptions about acceptable project risks and cost reimbursement requirements. Exhibit 2-5 illustrates the approaches taken by the various turnkey projects participating in FTA's TDP.

	Multiple Design/build	Single Design/build	Design/build-Operate
Civil or Systems		Los Angeles	
Civil + Systems	BART	Baltimore	
Civil + Vehicle		San Juan	
Civil + Systems Vehicle Joint Development			Honolulu Houston

Exhibit 2-5. Physical Scope versus Functional Breadth

Elements of Procurement

We speak of turnkey procurement as if it is a new approach to the procurement of transit construction or system delivery. However, there is little difference in the basic elements and principles of procurement from those used in conventional contracts. The methods of procurement, basis of contract award and types of contracts, are all identical and available for use in both instances. Three primary approaches have been utilized to procure contractors to implement major capital transit projects in the current round of Turnkey Demonstration Program which include:

- Formally Advertised Procurement
- Competitively Negotiated Procurement
- Two-step Procurement

Exhibit 2.6 on the following page illustrates a matrix of past, present and other future projects procured under a turnkey approach. It details the various approaches of procurement for each project, including project costs, type of turnkey, special legislation or exemptions, special teaming arrangements or financing packages, pre-qualifications, invitation for bid, industry review, negotiated procurement or qualification based or combination of factors, one or two step process, bid type, form of payment, and contract package size.

State Laws Allowing Design/build Procurement - Due to the differences in the scope of services in traditional and turnkey contracts, the method of procurement - vis-à-vis formally advertised versus negotiated - will change depending on whether state procurement statutes permit the use of either method. As a result, the bases of contract award, whether low price, evaluation factors or qualification-based selection, will also be impacted. With the advent of turnkey, many public agencies have obtained authority for the negotiation of contracts, which may obtain A/E services, preliminary engineering, and construction. While FTA does not restrict the method of procurement, many states' statutes do regulate this aspect of procurement. Where state procurement laws allow transit agencies to negotiate turnkey and construction contracts, this is perhaps by far the best method of establishing procurement. It provides the flexibility needed to more closely examine the capabilities of contractors, and also obtain their ideas and techniques for designing and building the project before selecting the contractor. Overall, it allows the owner to obtain the contractor with the most advantageous approach, as well as consider all factors, including price. When using the negotiated method of procurement, it is also recommended that an industry review of the proposed RFP be obtained before solicitation.

Restrictions on Design/build Contract Procurement - Where State law prohibits the negotiation of construction or design/build Turnkey contracts, the owner has a more difficult task in obtaining the "best value" in a turnkey contract. Obviously, with the Formally Advertised Procurement method, the basis of award will be Low Price, and the contract will be Fixed Price. The methods by which the owner can determine the qualifications of the bidders thus are limited. This in effect, allows the owner to state certain minimum requirements that bidders must possess, before they are allowed to submit a proposal.

Exhibit 2-6. Matrix of Turnkey Projects Procurement Methods

	Baltimore Light Rail Extension	San Juan Tren Urbano	Los Angeles Union Station Gateway	BART San Francisco Airport Ext.	New Jersey Transit Hudson-Bergen	Honolulu Rapid Transit
Project	3 Extensions total of 7.8 miles with 8 Stations	17 kilometer Track with 14 Stations/Vehicles	Intermodal Transit Center & 26 story Headquarters	7 mile track 4 Stations	10 mile Track Phase I with 17 Stations/Vehicles	16 mile Track with 22 Stations and Vehicles
Cost	$106 Million	$1.25 Billion	$295 Million	$1.2 Billion	$569 Million	$2 Billion
Type of Turnkey	Modified Turnkey	Modified Turnkey	Modified Turnkey	Design/Build	D/B/Oper./Maint.	Super Turnkey
Owner/Contractor Venturing					Yes	
Public/Private Venturing			Public/Private Non-profit Corp.			
Special Financing Package					Contractor Financing ($300 Million)	
FFGA	Yes	Yes	No	Yes	Yes	Final Draft
FTA Letter of No Prejudice	Yes	Yes	Yes	No	Not Needed	Yes
Record of Decision Notice	Yes	Yes	Yes (1983 EIR)	Yes	Yes	Yes
Pre-qualifications	Yes	Yes (Limited)	Yes	Yes	Yes (5 Teams)	Yes
Invitation for Bid	Yes	Yes	Yes	Yes (Two)	Yes	
Industry Review	Yes	Yes	No	Yes	Yes (5 Teams)	Yes
Negotiated Procurement or Qualification-based Procurement or Combination of Factors	Qualification-based on pre-established eval.	Negotiated BAFO	Best Value	Best Value	Price and other factors weighted	Combination of Negotiated and Qualification
One or Two-Step Process	Two Step	Two Step	One Step	One Step	Two Step	Two Step
Bid Type	Low Bid	Factors including Price, Technology and Management	Low Bid	Low Bid	Price and other factors weighted	Firm Price
Form of Payment	Fixed Price		Fixed Price		Guaranteed Maximum Price	Fixed Price
Contract Package	3 Line Ext. under One Contract	Systems under 1-6 other Contracts for Guideways	Broken Up-Addendum Process	4 Contracts - (1 for track - 3 for Stations)	One Package Contract	Single Package Contract
Special Legislation or Exemption	No	No	No	Yes (Pre-qualify)	No	No
DBE Outreach/Goal Established	Yes	Yes - 10%	Yes - 25% goal met and exceeded	Yes ((25.6% DBE 6.9% WBE)	Yes - 25% (various stages)	Yes - 15%
Joint Development Component						

Development of Procurement Documents

Pre-Qualifications

Most States have statutes that require a general contracting firm wishing to bid on public works projects to be adjudged, to be qualified before it can issue bidding documents, or before it can submit a proposal. To pre-qualify, contractors must submit detailed information concerning their personnel, experience, equipment, finances, current jobs in progress, and references. Evaluation of these data results in a determination of whether the contractor will be allowed to submit a proposal. Transit contractors usually submit qualification questionnaires at specified intervals, and are accordingly rated as to their maximum contract capacity. Their construction activities are reflected in their current ratings, with proposal forms being issued only to those qualified to bid on each project. The pre-qualification certificate may also limit the contractor to certain types of work, such as grading, concrete paving, or bridge construction.

There are several reasons to pre-qualify firms as follow:

- to identify stable contractors
- to prevent contract performance problems
- to ease the evaluation process
- to obtain the positive benefits of contractor competition

Pre-Qualification and How it May Affect Equal Opportunity - There is a perception that pre-qualification restricts inclusiveness of small and disadvantaged firms from participating in the procurement process. The issue of pre-qualification is an area of particular concern to BART, since they were previously involved in litigation concerning this matter. Pre-qualification process narrows the list of bidders allowed, thus providing some of the advantages of the Negotiated Procurement. As mentioned earlier, this will help identify qualified contractors with proven contract performance, which will ease the evaluation selection process, and help achieve positive benefits of contract competition. So long as the process is fair and competitive - where an established criteria openly exists which allows sufficient participation by a number of firms - then pre-qualification can help achieve its goal. This process is consistent with FTA C 4220.1D and the Common Grant Rule. To accomplish inclusiveness, BART conducted a comprehensive outreach by sending out pre-qualification statements to 1000 recipients.

Role of Pre-Qualification in States that Prohibit Design/build - From a practical standpoint, pre-qualifying bidders has limited use, except where State law prohibits negotiation for Turnkey procurements. In formally advertised procurements, the only tools for evaluating bidders, other than price, is the determination of responsiveness and responsibility. Whereas in a negotiated procurement, evaluation factors, competitive range (such as past performance, technical merit, qualification of personnel), provide substantial opportunity to establish a level of confidence in the selected firm. In effect, the pre-qualification process, if properly structured will provide the owner with much of the information obtained during negotiations. It is crucial for the agency to know ahead of time the firms' capabilities, personnel, equipment and commitment to carry out

the type of job required from contractors and subcontractors. It is critical to evaluate the firms so as to make sure that they will not file for bankruptcy. Such a situation might force the prime contractor to make substitution of the subcontractors, a condition which can be devastating to the turnkey process. Since turnkey method procurement is a process oriented change, the expedition of time to meet deadlines is important, if penalties and liquidated damages are to be avoided. In multiple phase projects which most complex turnkey procurement require, it might not be easy or wise for an agency to try to solicit and evaluate firms every single time a contract need to be procured.

Affects of Qualification Up to Closing Date of Solicitation - While FTA does not discourage the use of pre-qualification, it does place certain requirements on the grantee. The requirement that places limits on pre-qualification is the requirement in FTA's Circular 220.1D. It allows potential bidders qualification up to the closing date of solicitation, thus limiting effectiveness of the RFQ and its Closing Date. In complex turnkey procurement, this is somewhat of an anomaly, since there needs to be sufficient time to evaluate the qualification of the potential bidder, and to approve or disapprove the qualifications. If approved, the bidder would need lead time to prepare a bid, which could mean that the grantee must delay bid opening, in order to allow the late bid to qualify. This delay can only add to the time frame of contract procurement and program planning, thus removing one of the stated advantages of turnkey method procurement in transit delivery. This issue could be addressed in future FTA Circular updates.

Invitation for Bids (IFB)

There is little difference in the IFB process between turnkey and conventional procurement. The primary difference is in the magnitude of the project. Therein lies the difference that the specifications will not be as definitive or as near-complete on a large project, as a smaller and better defined project. The end result will be that more changes will be required once the contract is awarded, thus leading to increased unforeseen change orders, project implementation schedule delays, and of course increased project costs. To compensate for this, and to assure that the awarded low-price contract is not compromised due to change orders, as much pricing detail as possible should be obtained in the original bid. In addition, the contract language, including changes, should assure that pricing data such as unit prices, can be applied to positively or negatively changed quantities.

Industry Review

Industry review is an important process in turnkey procurements, since it addresses questions and concerns regarding financing, level of engineering, risk management, project management roles and responsibilities. Industry review of draft procurement documents, prior to start of procurement cycle or Solicitation Phase is not needed on an IFB approach to procurement. Generally, industry reviews are used when competitively negotiated procurements are being contemplated. The uncertainties and complexity of negotiated procurements are far different from a well-defined IFB. Where State law allows the negotiation of turnkey contracts, the flexibility to structure the contract and manage the project, is far greater than with the Formally Advertised process. Again, the magnitude and complexity of the turnkey project, is the reason for a variation in the procurement process. Just as pre-qualification is used to assist and enhance

the IFB process, an Industry Review of the proposed RFP will assist and enhance the negotiation process.

The formal procurement cycle - whether for formally advertised or negotiated procurements - is a very structured process which must be strictly observed, in order to maintain the integrity of that process. While there is much work to be done in the pre-solicitation or planning phase, i.e., identifying the requirements, funding, specifications, etc., the formal procurement cycle only begins when the IFB or RFP is released.

Issues and Opportunities in Industry Reviews - Due to the magnitude and complexity of turnkey procurements, it is essential that potential problems in the procurement be identified early on, and addressed before the procurement cycle begins. The problem areas can range from excess bonding to unrealistic technical requirements. It is much simpler to discuss those problems with industry representatives in a less structured environment, where revisions can be easily and quickly identified and made, rather than running the risk of protested or delayed procurements, once the formal cycle begins. If the industry review described above is handled properly, the solicitation and evaluation phases, while complex and time consuming, should follow the routine competitively negotiated process. Although there will be A/E services involved in this type of procurement, it is not a major component of the project.

Industry Reviews provides opportunities for contractors to submit comments on one-to-one basis not available during procurement cycle. Once the procurement package is prepared by the owner, and ready for solicitation phase, it should be made available for industry representatives for written comments. During the industry review, Maryland MTA did not share any of the documents that it received from one contractor with the another. The agency established a one-to-one interview process, with each side exchanging questions and answers. Discussion of comments in scheduled meetings with individual contractors thus becomes vital. Once these comments are received and reviewed by the agency, company-by-company meetings can be scheduled for more detailed discussions on expert industry input or concerns. It is to the advantage, on any turnkey project, for the owner to accommodate, where feasible industry's comments, concerns and even objections. Once this phase is completed and the solicitation package is modified, the procurement cycle can begin with the advertisement for the proposals. It should be noted that industry review process in the case of Honolulu Turnkey project, was instrumental in effectively eliminating the 100-percent bonding requirement.

Industry Reviews and the FTA Circular Guidelines- FTA Circulars and other Federal procurement procedures are silent with respect to industry reviews, since it is not considered part of the procurement process. The industry review can be properly classified as part of the management and administrative process, in preparation for the Turnkey procurement. FTA Circulars should formally address this important step of the Turnkey procurement.

Competitive Negotiation vs. Formally Advertised in Turnkey Contracting

One of the primary issues in acquisition planning is consideration of the method of procurement, the basis of contract award and the type of contract. Just as in acquisition planning process itself,

there is no difference in consideration of the procurement principles involved in the conventional vs. turnkey approach. However, with one exception, that is where the similarity ends. The exception, of course, is the State and local laws governing the methods of procurement and the basis of award.

State Laws Governing Methods of Procurement - In many states, as it will be brought out in this paper, the qualification-based selection procedure is mandated for the procurement of architect-engineering services. Just as the Federally-defined mandate (as incorporated in the Brooks Act) sets out those services included in Federal qualification-based selection, each State defines what is considered A/E services and mandates the selection process for those services. It is not surprising, for example, that Texas being the home of the "Brooks Bill" author, would have one of the most well defined and broad mandates covering the qualification-based selection process. It would seem that the definition of an alternative procurement process, basis of selection, and the types of contracts for services and supplies, received comparable attention in the Texas state procurement code. This brings any owner contemplating a transit project, whether conventional or turnkey, to the first basic consideration in the procurement process (i.e. what the State procurement laws and procedures require). The Federal procurement (including FTA's) restraints, seldom reach the level of consideration or have any real impact, since the State procurement codes are far more restrictive and directive.

Conventional vs. Turnkey Procurement Approaches - Once the State Procurement code and procedures have defined the broader guidelines for both conventional and turnkey projects, the differences in the two approaches to a project still take on a significant difference in the impact of the procurement process. In the conventional procurement approach, the owner will first consider a qualification base solicitation, and probably a fixed-price contract for General Engineering Consultant (GEC). As discussed in the acquisition planning, the contractor will provide the owner services for system design and integration oversight. The contractor will also provide procurement services for obtaining contractors for manufacturing, construction and installation, test and startup, as well as operation and maintenance, if required. The latter service of the GEC will involve, among other things, the writing of specifications, solicitation, evaluation and recommendations on award of the various contracts. In summary, the GEC provides the technical and management capability that the owner needs but does not possess, to assist in the overall management and technical guidance to complete the project.

Major Procurement Processes - In the conventional procurement, there is little innovation, ingenuity or uniqueness in approach required in the procurement process. While it may be cumbersome, complex and time consuming, the conventional procurement approach presents no unusual challenges in the procurement process, and is well understood by all involved. The three major procurement processes are listed below. It should be noted that there is no difference in the three procurement procedures in the turnkey approach. The difference is in the application, or use of those procedures and the adaptation of those procedures to one or more of the variations of the turnkey process.

1. **Formally Advertised (IFB)**
   a) Detailed, design specification.
   b) Award to the responsible and responsive bidder with lowest bidder.

c) Award of a firm fixed price contract.

2. **Competitive Negotiation (RFP)**
   a) Performance specification with evaluation factors including price.
   b) Initial proposals.
   c) Evaluation of proposals to determine competitive range.
   d) Discussions, both verbal and written with each proposer in the competitive range to assure a full understanding of the terms and conditions of the proposal and the resulting contract.
   e) Best and Final Offers (BAFO).
   f) Final evaluations and selection of the contractor.
   g) Award of fixed price contract.

3. **Qualification Base Competitive Negotiations (RFP)**
   a) Performance specifications for proposals, strongly emphasizing qualifications and precluding the submission of prices.
   b) Submission of proposals and qualifications.
   c) Establishment of a short list (usually 3-5) of the most qualified proposers.
   d) Presentations by and discussions with the short listed proposers.
   e) Selection of best qualified proposer.
   f) Negotiation with best qualified proposer on a contract, including negotiation of a fair and reasonable price.
   g) Award of a fixed price contract.

Limited Turnkey Procurement - In a limited turnkey scenario (which is a modification of the conventional procurement process), state and local or jurisdictional procurement regulations limit the methods of procurement of certain goods and services. There may be separate conventional procurements for certain services such as A/E, while combining all or part of the remaining supplies and services into a turnkey contract. The owner must look at various groups, or what could be considered groupings of supplies and services, to determine what can be combined. The major projects are technology selection, construction, operation and maintenance.

The second consideration relates to a subset of the method of procurement, where not only is there a requirement to obtain such services as A/E separately, but where formal advertising and award based on low price is also required. The problem here is not only the exclusion of certain goods and services from the turnkey portion of the contract, but a limitation on the basis of the contractor selection to a low bid approach. The complexity of turnkey approach increases as the variety of goods and services are combined to form the turnkey portion of the contract. Thus, more needs to be known about qualifications of bidders where design-build contracts are allowed by a State, however the process is limited to awards based on price alone. The owner must find more innovative ways to assure that the lowest price also provides a contractor who is technically competent to satisfactorily complete the project. One way of accomplishing this, is to employ the process of pre-qualification, where the capabilities of bidders can be more closely examined before they are allowed to bid on a project.

Risk Management

Capital intensive construction projects are inherently loaded with uncertainties and unforeseen events. For turnkey procurement, it is important that risks are identified early-on, allocated between the owner and contractor, and risk management instruments are identified in the contract. Risks can occur for instance by not having adequate funding / bonding in place prior to the start of a project which may lead to premature project cancellation by the owner, such as in the case of Houston and Honolulu, which was due to mainly lack of support for the project and its funding. This section attempts to address how turnkey procurement approach can provide opportunities for innovative answers, to issues arising from procurement contracting. Such issues include funding / financial arrangement and considerations, selection of developer / contractor teams, methods for managing risks, insurance and bonding requirements, and dispute resolution arising from contracting and subcontracting activities.

The Turnkey Evaluation Guidelines developed by Volpe Center for FTA has identified functional areas or activities, where primary responsibility can be shifted from the owner or agency to the turnkey contractor, thus reducing the associated risks as shown in Exhibit 2-7 (a) and 2-7(b) on the following pages. In general, roles, responsibilities and associated risks should rest with those who possess the best ability, experience, or authority to effect a positive project outcome. It should be noted that there are a number of project tasks which are traditionally the responsibility of the sponsoring agency (e.g., right-of-way acquisition, utility relocation, geotechnical work, interagency coordination), and should not be transferred to the turnkey contractor. Contractors can usually offer guarantees against unknown risks such as those mentioned, but usually at a higher price.

Dealing With Risks in Turnkey Procurement

Fixed-guideway transit project development is a high-risk undertaking. Risks present in fixed-guideway systems can be addressed through well recognized techniques such as Full Funding Grant Agreement (FFGA), Letters of Credit, Board Resolutions from sponsoring agencies regarding the flow of funds, pledges to maintain dedicated tax levels, limitation on the use of certain public revenues, the establishment of reserve funds, and adequate contingency budgets.

Allocation of Risks Between Public and Private Entities - One of the primary benefits of innovative procurement techniques like design/build or turnkey, is the ability to allocate risks between public and private entities. The public sector bears most risks in traditional procurement, specifically when dealing with project implementation and future revenues. The Turnkey strategy allows some sharing or complete shifting of risk to private contractors. The potential

Exhibit 2.7(a)
Turnkey Variations by Functional Responsibility

Functional Name		Functional Activities
Preliminary System Configuration	C	perform all preliminary Systems studies
	C	determines alternative routes and selects preferred route
Preliminary Design and Operational Criteria	C	perform all preliminary design
	C	perform systems analysis to ascertain requirements
	C	select guideway and structure
	C	develops stations criteria
	C	develops facilities design and layouts
	C	defines ongoing operational standards
Preliminary Value Engineering/Peer Review	C	selects value engineer or peer reviewer to assess all work products of C and subcontractors
Preliminary Work Breakdown Structure	C	develops work breakdown structure
Preliminary Configuration Control	C	can add any phase to project
Quality Assurance	C	performs all QA assessments on subcontractors
	C	submits design and engineering work to assessment by independent parties other than A
Schedule Control	C	establishes all schedules for design
	C	establishes all schedules for construction
	C	monitors compliance to schedule by sub-contractors
	A	does not monitor schedule on an ongoing basis
Cost Control	C	responsible for all cost control. no change orders permitted in project
Information Management	C	develops all management information systems
Real Estate Acquisition and Management	C	responsible for acquiring property
	C	responsible for funding/financing real estate acquisitions
	C	responsible for obtaining government authority
Preliminary Procurement	C	responsible for design regardless of budget
Risk Management	C	responsible for certain risks
	C	obtains and maintains necessary professional and liability insurance to protect A
Final EIS	C	responsible for performing EIS
Cost Estimates	C	provides all cost estimation
Project Management	C	responsible for control of labor and materials

C = contractor; A = agency or owner
source: Richard J. Lobron, Lobron Consultancy, Ltd.

Exhibit 2.7(b)
Turnkey Variations by Functional Responsibility

Functional Name		Functional Activities
Project Planning	C	responsible for all project planning
System Planning	C	responsible for all system planning
Air Quality Planning	C	responsible for conformance to air quality requirements
Energy Conservation Planning	C	performs all energy conservation reporting
	C	represents project and A at all hearings
EIS Reporting	C	performs all environmental impact studies
Section 4F	C	performs all Section 4(f) parkland use alternatives
	C	proposes and evaluates 4(f) parkland use alternatives
	C	represents project and A at all hearings
ADA Requirements	C	responsible for design of all accessibility items
	C	responsible for project conformance to ADA requirements
Buy America	C	ensures conformance with Buy America requirements
	C	presents all certifications concerning Buy America requirements
	C	performs and monitors all required Pre-award and Post -delivery Buy America audits
Public Participation	C	coordinates all public relations regarding project
	C	responds to all external inquiries concerning project
	C	represents A at all hearings and public conferences on project
Locally Preferred Alternative	C	develops all potential alternatives for consideration as the LPA
	C	presents alternatives to MPO
	C	represents A at all hearings and presents recommendations for LPA
Project Management Plan	C	prepares and submits project management plan to FTA
	C	addresses potential issues related to FTA Section 13c labor impact requirements
Project Management Oversight	C	coordinates all activities with PMO consultant
	C	serves as prime liaison with PMO consultant
	C	serves as prime liaison with FTA personnel and advisors
Hardware Selection	C	selects all hardware for project or system

C = contractor; A = agency or owner
source: Richard J. Lobron, Lobron Consultancy, Ltd.

"Owner"	"Turnkey Contractor"
-Local transit agency/operator	-Construction contractor
-Local government	-Equipment vendor/suppliers
-State agencies	-Private equity contributors
-Federal Transit Administration	-Insurance providers
-Financing Institutions serving government agencies/taxpayers	-Financial institutions

Difficulty in Measuring Risk Allocation - Differences of measurement in risk allocation is difficult between traditional and turnkey process, since risk allocation measures only probability factors. Assigning the allocation of risk and monitoring is a challenging aspect of turnkey risk management. Risk premiums can be minimized in fixed-price procurement, by definitizing the project definition at the time of contract initiation, and by advancing engineering studies on complex system segments, and by undertaking early right-of-way assembly, acquisition and utility work. The risks from variation in project costs can be mitigated by entering fixed-price contracts, agreeing to share cost over-runs caused by specific factors (such as inflation, work stoppages, new Federal mandates) capping contractor liabilities, securing insurance and performance bond coverage, and by calculating independent contingencies for specific project elements (land acquisition, utilities, at-grade construction, tunnels and other segments).

Funding and Financing

In Search of a New Paradigm - The lessons learned from the failed Honolulu and Houston attempts, to develop a fixed-guideway system using a superturnkey procurement approach, clearly illustrates the critical need to have the funding and political support in place, prior to commencement of project procurement. From an economic point of view, the transit industry does not seem to be taking full advantage and credit for the investment it makes. Herein lies the key problem, in that transit agencies do not often take full advantage in leveraging their assets, as a means and opportunity to financing future development of transit systems. Clearly, the transit sector must start claiming the economic, social and environmental benefits that it generates from its operations. The industry could begin participating more, and enjoying the benefits resulting from joint development activities and programs. Additional approaches that could be undertaken as part of this paradigm, could be to tap into revenues from congestion pricing on highways or from toll roads. Such an approach was used by the Orange County Transportation Authority, which also operates a transit bus system, when it developed the Route 91, high occupancy vehicle (HOV) private toll road. Additional examples of this new transit paradigm, authorized under ISTEA, is Puerto Rico's Department of Transportation project, to develop San Juan's Tren Urbano, using Federal Highway Administration - Surface Transportation Program funds to issue Certificates of Participation for front-end financing the Tren Urbano project in San Juan.

A number of innovative funding and financing approaches have been utilized by the current Turnkey Demonstration Program (TDP) participants to pay for transit projects. Numerous suggestions have also been made by those who have attended a number of the TDP expert forums, workshops and panel discussions since 1994. It has been suggested that the grantees should shift their outlook to secure full funding agreement for transit projects, from a short term

(3-5 years) to a longer horizon, to reflect the fact that such assets will be in service for 50 to 100 years. The industry must begin to match the flow of funds to the life expectancy of the project.

Looking for New Funding Approaches - It has been suggested that transit agencies or grantees consider a different approach to securing financing and bonding requirement, one that reflect an Asset-based rather than Debt-based financing. Transit agencies should take full advantage of the available line of credits that the particular agency possesses. Lacking a Full Funding Grant Agreement and full bonding when the USG intermodal transit center began construction, the Los Angeles County MTA had to resort to commercial paper, which fortunately carried a low interest rate at the time, to smooth out the flow in between the grants. Additionally, transit agencies could try to take credit and full advantage by tapping into a steady stream of revenues from congestion pricing on highways, toll roads, fees from parking garages in/around transit stations or park-n-ride lots.

New Federal Funding and Financing Opportunities - FTA could explore mechanism which would allow the federal government to provide interim short-term loans to grantees at low interest rates. Such a scenario could be accomplished through infrastructure state banks. With the consent of Office of Management and Budget, grantees could establish lending agreements among themselves to advance funds "warehoused" for projects waiting to move into construction phase. These transactions could be structured either through clearinghouses established at state level, bilateral agreements, or trustee arrangements instituted through private banks. additionally, "swaps" of local tax and Section 9 funds made between jurisdictions, freeing these "reserves" could increase the pace of transit construction activity.

Innovative Funding for Turnkey Approaches - More and more, transit acquisition planning and procurement strategies are looking for ways to provide transit development funding and financing through the involvement of the turnkey contractor in the funding/financing formula. The New Jersey Transit Hudson-Bergen turnkey project is one such example, where developer/ turnkey contractor participation was an integral part of the procurement strategy. Another example of innovative turnkey project funding/financing is the San Joaquin Hills Transportation Corridor (SJHTC) toll road developed by Orange County, California, which employed a very diverse, segmented financial program that was packaged in an innovative way. The financing package was segmented to diversify the long-term risk, and based on Federal Highway Administration's criteria, it was able to provide a $100 million credit line to the SJHTC. Furthermore, contracts for the construction of Orange County's SJHTC and the new Eastern Corridor, included agreements by the contractor to accept deferred subordinated project revenue certificates, in lieu of progress payments. These certificates bear a relatively high interest rate and are issued towards the end of the construction period. The fact that the contractor has committed to accept such certificates is a significant factor in the bondholders' investment decision, because this commitment provides a strong incentive to the contractor to complete the project on time and on budget. On the Eastern Corridor (EC) project, the contractor financing was built into the original invitation for bids. Each bidder was required to commit to accept certificates, if its bid exceeded $800 million. In addition, the contract obliged the contractor to accept certificates to pay for half of the first $20 million of change orders excluding agency-directed discretionary changes in the project.

Teaming, Partnering and Joint Venturing

Developing an appropriate effective team is crucial in the undertaking of turnkey projects. Whether it is selecting the prime contractor / turnkey vendor, or joint venturing with a private entity, there needs to be a relationship that fosters and harnesses the unique capabilities of each group in the formula for accomplishing a successful transit endeavor.

Factors to Consider When Teaming or Partnering - The strategy for selecting a turnkey strategy should consider the strengths and weaknesses of the local lead agency, their prior major project development experience, amount of control and project management scope, and the amount of resources, both personnel and financing, that the agency possesses. There should be compelling reasons for selecting the turnkey method that should include cost, schedule and/or technology improvements, financial participation, joint development, among others, since the process differs in many ways from traditional contracting experience. All of these combined, make up the elements which go into putting together a team which offers uniqueness, individuality, strengths, and a commitment to a common goal. All of these variables will come to play on the individual components of the turnkey procurement approach, i.e., planning and design function, construction contracts, project management system, and the roles and responsibilities of project participants.

To successfully venture in transit turnkey projects, a good team needs to be developed and maintained through the entire procurement process. It will demand a team which is professional, disciplined, and committed to accomplishing a common goal. Often the team is small, consisting of a handful of individuals and key players, who possess experience, authority and control to make decisions on the spot. In pursuing turnkey approach procurement, it is important to harness the best strength of both parties, explore innovative techniques to problem solving, develop financial incentives that are mutually beneficial to both parties. Finally, there needs to exist among team members, a spirit of cooperation, trust through verification, and even to an extent, a personal crusade to the accomplishment of the stated project goal.

Organizational Structure, Roles and Responsibilities - Establishment of clear organizational structure, their roles, responsibilities and reporting requirements, should be made up-front early on in the procurement process. Team members should have flexibility, yet a clear understanding as to structure, decision making process, that govern the management of the turnkey project at hand. Effective and clear communication channels and procedures, speed of response by agency to issues, will expedite in solving concerns before they become problems. It is imperative that the team members leave a consistent, clear, and traceable trail when decisions are made along the way.

Understanding Owner and Turnkey Developer Functions - Understanding the public agency or owner's roles and responsibilities as oversight function, rather than dictatorial one, is an important distinction in turnkey procurement. The owner's job is to articulate to the team members selected, the organizational functions and responsibilities, the reporting requirements by the contractor, as well as the fiduciary requirements of the team. The public side should be involved with property acquisition (sales, swap or bartering), acquire the necessary permits, coordinate the relocation of utilities, upgrade streets and freeway ramps. The private sector can

provide different attributes and benefits, depending on what they are being asked to perform or accomplish, and can bring new ideas and innovative solutions which may or may not be proprietary, such as systems.

Teaming and Joint Venturing Opportunities in Turnkey - When considering the functional interrelationships between the various team members, i.e. , transit agencies, business entities, developers, it is important to extend the notion of joint venturing or joint development, beyond the classical sense into a new paradigm, one that includes the partnering of public needs with the business/economic concerns. An example of this is the newest of the Turnkey Demonstration Program participant, the New Jersey Transit Hudson-Bergen Line which is looking to bring on board the utility company as an equity partner. The logic behind this is that the rail line will require electric assets and facilities to support distribution and sale of power to other needs in the area. The utility company will benefit from development which will be stimulated along the Hudson River waterfront as an outgrowth of the light rail project.

Another example of these innovative joint venture teaming is the case of the Los Angeles MTA in its development of the Union Station Gateway turnkey project. The Authority was interested in developing a headquarters building, as well as a major intermodal transit facility which included a regional hub for Amtrak and Metrolink commuter trains, regional line haul buses, express and local transit buses, park-n-ride and child care facilities. The developer, Catellus Development Corporation, which owned the historic Union Station and the land contiguous, responded to the RFP, and was ultimately selected from a field of 61 proposers, as the turnkey developer / contractor. A unique public / private partnership was undertaken in this case, which created a non-profit corporation known as Union Station Gateway, Inc. (USG), whose sole function as developer/contractor was to design/build this new transit facility. The Board of Directors of USG consisted of three members each from LACMTA and Catellus Corporation respectively. The function of USG was specifically to oversee, administer, and procure the needed contracts to undertake this unique turnkey project.

Dispute Resolution

Once construction commences in a turnkey contract, most grantee procurement actions are too late, since the emphasis in this area of activity shifts to enforcement and dispute resolution. The long-term, risk and responsibility sharing nature of turnkey contracts, requires that means for handling disputes be addressed up front in great detail. As with conventional contracts, most disputes will arise when the client cannot provide prompt answers about crucial elements, thus delaying the process. Additionally disputes can stem from flawed contract documents, either by the grantee, or by errors of judgment by the contractor.

Dispute resolution procedures include the following range of actions:

- Partnering as Risk Management Technique / Tool
- Independent Board of Consultants
- Arbitration
- Mediation Through Facilitator or Broker

- Dispute Board or Board of Contracts Appeals
- Litigation

Current Practices in Dispute Resolution - The current Turnkey Demonstration Program projects have instituted a comprehensive dispute resolution process (Alternative Dispute Resolution), and panels/boards, (Dispute Review Board or DRB) intended to receive, process and manage disputes, as in the case of BART mentioned here. In addition, a separate DRB will be established for each contract. If the contractor or the District cannot obtain satisfaction through the DRB, either can still file a claim against the other under the terms of the contract. BART is in the process of developing a Construction Oversight Manual that includes Notice of Claim, Dispute Review Boards, Mediation and Filing of Claim/Litigation procedures for the Design/ Build contracts. Dispute resolution can also be mitigated through escrow of the bid documents, as BART did on its airport extension project.

Change Orders

Most construction projects experience some sort of change sometime during the life of the project. The design/build entity should be better equipped to respond and adapt to changes during construction, than those parties using traditional methods of project delivery. The link between the discovery of a problem or changed circumstances, and the solution to the problem or change, is much closer in a turnkey method, since the design and construction activities take place under the same roof. Finding a solution and then communicating it to those responsible for the change, thus can be done less formally and more quickly. Documentation can often be prepared while the change is being implemented, since the primary purpose is to record the change rather than instruct the contractor. Depending on the contractual arrangement between the design/build entity and the owner, and the extent of owner involvement in certain project decisions, owner approval may not be necessary at all, unless of course the change is initiated by the owner. Change orders for turnkey should be low, due to its single source responsibility, whereas with multiple prime subcontractors, change orders can be many due to the conflict among the various entities.

Change Orders in Turnkey Process - Change orders can be more costly in turnkey variation than with conventional procurement. A firm line must be established by the owner or agency, so as to avoid major changes as much as possible. Deviations or modifications in turnkey procurement must be minor and agreed upon jointly by both parties. In the case of Baltimore and Los Angeles, a clear and firm message was given by the agency Board and staff, that change orders were not acceptable, or tolerable. In the case of the Union Station Gateway project in Los Angeles, officially only a one small change order occurred during the entire construction process.

Insurance Requirement

Recognize Industry Limitations on Insurance - Insurance is based upon broad categories of risks that have been identified through past experience, relative to the roles of contracting parties, the owner, the contractor, architect, subcontractor, suppliers, lenders or surety as defined by custom and case law. The underwriting process is a very subjective, and a function of the underwriter's experience in assessing risks, especially as it relates to Turnkey procurement. Currently, no single policy of insurance covers the risk of design/build process. Consequently, the design/builder must look to conventional types of insurance to protect claims and losses.

Also, currently sufficient 'loss' experience in design/build does not exist to give the underwriter rating firms clearly defined categories that are part of risk assessment.

Methods of Dealing with Liability and Insurance - The following are potential methods that a design/builder can address with professional liability, and third party issues with insurance:

A. **Professional liability** - Proof of professional liability insurance is required regardless if the procurement is traditional or turnkey, which are available in are two basic variations. One has coverage for negligent errors, omissions, and acts of the design professional's (but excludes faulty workmanship or not in compliance with the construction documents) failure to complete counteraction in a timely manner, and consequential losses. The other variation includes all the standard coverage, but broadens coverage, by adding direct or contingent liability provisions, faulty workmanship for work performed by, or for the design/builder.

B. **Third Party Liability Issues** - The Turnkey contractor, like the conventional, will most likely have to subcontract some portion of the work to subcontractors, and will definitely have to procure materials from a host of suppliers. It is critical that the design/builder has appropriate legal safeguards in place, to insure that subcontractors and supplier conform to the master contract. One or more of the following can be used to remedy this situation.

    1. Incorporation of Reference Clauses that incorporate the general contractor's agreement with the owner by reference into the subcontract between the general contractor and the subcontractor or supplier.
    2. Scope of Work Clauses which imposes an obligation to the subcontractor to do whatever is necessary to complete their portion of the project, so long as it is reasonably inferable from the contract documents.
    3. Flow-Down Clauses which typically transfers to the subcontractor or supplier, all obligations that the prime contractor owes to the owner.

Owner Provided Insurance - In the case of Baltimore MMTA, in Phase I of the LRT extension, two projects were brought together under 'owner controlled insurance' program. The insurance entity had informed MMTA that at the $50-70 million range, the agency was on the lower threshold of having an acceptable level of "wrap-up" Coordinated Insuring Program (CIP). Therefore, after reviewing the administrative costs, MMTA decided not to proceed with a CIP approach. There have been no concerns from contractors whether or not "wrap-up" insurance

has been provided. Similarly, the Los Angeles MTA which had created a hybrid group consisting of public/private joint-venture entity, decided to use "self insuring" method.

Use of Liquidated Damages - Liquidated Damages are used when grantee reasonably expects to suffer damages due to late completion, or the contractor has not lived up to the subcontracting agreements, as it relates to small and disadvantaged business enterprises. Liquidated damages may also be used by the contractor or developer against the owner, for failure to consummate the turnkey project, due to the lack of the necessary political and/or financial commitments, as in the case of Honolulu or Houston fixed-guideway systems. Issues relative to liquidated damages must address: _

- Extent or amount difficult or impossible to determine.
- Rate must be reasonably related to actual damages suffered, or will be considered a penalty.
- Damages recovered must be credited to project account.

In the case of the San Joaquin Hills and the Eastern Transportation Corridors (SJHTC, ETC), which are being developed by Orange County, California, both contracts provided for significant liquidated damages, payable by the contractor for failure to complete on time. Damages were based on the projected loss of toll revenues resulting from the delay. The total liquidated damages for SJHTC are $225,000 per day, and $215,000 for the ETC.

Performance and Payment Bonds

Performance and payment bonds are designed to protect the project sponsor, in the event the contractor fails to perform per terms and conditions of the contract. Should the contractor fail to meet its contractual obligations, the surety issuing the bond will compensate the sponsor for its losses. The practice of surety bonding was developed within the context of traditional procurement method, where the design and individual construction activities are performed by separate entities, and in separate stages of project development. In this environment, the bond provided protection against a construction contractor's failure to meet the design specifications produced by a design firm. Since the design specifications were completed before initiation of the construction phase, these specifications provided information that the sureties could use to evaluate project risk, and the amount of bonding required to cover that project. Also the bonding amount is typically required to equal the full project cost amount, which in traditional procurement is equal to much less than full turnkey amount. This full bonding amount greatly exceeds the actual cost to recover from losses incurred.

Bonding Issues Arising from Lack of Final Design Drawing - Under a design/build procurement, contracts are signed before final design has begun, and construction usually begins before project designs have been fully specified. Thus, in this environment, the surety entity lacks a primary means of assessing project risk, and may decline to issue bonds to cover entire bid amount to cover the full cost of the project. Given the overlap of design and construction activities in turnkey, there appears to be no simple means of supplying sureties with the detailed designs information that they need. Under this circumstance, it would seem prudent to favor postponing initiation of the turnkey contract, until the project has reached the maximum practical

level of definition (e.g., until after completion of preliminary engineering), and then request a waiver to bond an amount equal to less than the full project cost. This practice would provide sureties with the best possible information, on which to base their analysis, and a more realistic project cost recovery amount to bond toward, thus facilitating the process of obtaining turnkey project bonding.

In the case of the Houston project, METRO first required the successful proposer to furnish performance and payment bonds, valued at 100% of Phase I contract value of system component for the Initial Line. The contractor was not required to furnish these bonds until just prior to the issuance the Phase II Notice to Proceed. Hence, the sureties would have access to the preliminary engineering designs, covering thirty percent of the completed final designs. Second, proposers were required to submit details of their experience in obtaining performance and payment bonding, especially on projects in the order-of-magnitude of the current turnkey project, including any default s over the last 10 year period.

General bonding for the Los Angeles Union Station Gateway was not authorized until after the construction had already started. The delay was due to controversies about budget, as well as the merger of former Los Angeles County Transportation Commission and the Southern California Rapid Transit District, which created the Los Angeles County MTA. Full bonding for $169.5 million, including $24 million for financing or bond reserve, was finally accomplished well after the project was under way.

Bonding Requirements on Large Turnkey Projects - Often in large turnkey projects such as Honolulu or Houston, the bonding requirements would have exceeded the ability of the surety industry to provide bonds. Big umbrella bonding or excessive bonding requirements can be restrictive of competition and often create a major barrier to contractors willing and able to participate in turnkey advances. Large conventional or turnkey contracts which are not parceled into small, more manageable segments, can cause extreme and might also prevent participation by many prospective contractors, specially small and disadvantaged business. One approach to addressing this issue is to develop smaller, finite construction packages that can be accomplished incrementally through an addendum process, such as the process used by Los Angeles County MTA on its Union Station Gateway Project. Owners of large turnkey projects should be sensitive to this important issue, and consider carefully breaking up of very large contracts into smaller sizes. Such a scenario may result in a more manageable task, often providing simpler and clearer understanding as to the scope of the contract. This will make the project less risky, thus easier to bond and insure, which can in turn have an enormous impact on the ability and competitiveness of small and disadvantaged firms.

SUBCONTRACTING AND UTILIZATION OF SMALL AND DISADVANTAGED BUSINESSES

Laws Relating to Equal Employment Opportunity and Labor Compliance

A number of laws, both federal and local relating to the provision for, and compliance to labor and equal employment opportunities, come into play in turnkey or conventional contracting. The topic of procurement in transit development, as it applies to third party subcontracting issues, especially incorporating small and disadvantaged (both minority and women) business enterprises, has suddenly catapulted to the forefront as issues to contend with and controlled by public agencies. The issue of providing for an atmosphere, where conditions for 'fair and open competition' and a 'level playing field' can exist, seems to be again on the front page.

Laws and regulations which bear upon labor issues, as well as those prohibiting discrimination, while encouraging Small Business Enterprises (SBE), Disadvantaged Business Enterprises (DBE), Minority Business Enterprises (MBE), including Women Business Enterprises (WBE) are listed below. These laws deal with general labor and procurement issues in construction and professional services contracts by the federal government and its grantee programs, as it relates to third party contracting rules and guidelines. These include:

- Title VI of the 1964 Civil Rights Act
- Davis Bacon Act
- Executive Order 11246, as amended
- Rehabilitation Act of 1974 - Section 503, as amended
- Vietnam Era Veterans' Readjustment Assistance Act of 1974, as amended
- Small Business Act 15 U.S.C. 636 (j) (10) - sections authorizing 7(j)(10) and 8(a)
- Federal Transit Act U.S.C. Chapter 53, new codification as part of Public Law 103-272
- 13 CFR Parts 121 and 124 - Small Business Size Regulations
- 41 CFR 60-4.3(a) - Equal Opportunity Clause, specific affirmative action obligation specs
- 49 CFR Part 18, Common Rule for Grants/Cooperative Agreements for State/Localities
- 49 CFR Part 21, Non-discrimination in Federally-Assisted Programs
- 49 CFR Part 23 - Part II of DOT - Participation by DBE in federal programs
- 49 CFR Part 23 - Part VI of DOT - Participation of MBE in DOT programs
- Federal Transit Administration- Circular C 4220.1D; Third Party Contracting Guidelines
- Federal Transit Implementing Guidelines (UMTAC 4702.1)-for Title VI Specific
- Federal Transit Administration - Circular 4704.1 - EEO Guidelines for Recipients
- Federal Transit Administration - Circular C 5010.1B; Grant Management Guidelines
- Other State and local laws and regulations regarding EEO matters

Federal Impact and Court Challenges

These laws not withstanding, there continues to be administrative and compliance issues, as well as legal challenges from both sides regarding the use of affirmative action in the procurement arena. President Clinton in his Executive Order 12928 of September 16, 1996, reaffirmed his commitment to promoting increased participation in Federal procurements by small business owned and controlled, and by economically disadvantaged individuals (SDBs), historically Black Colleges and Universities (HBCUs), and minority institutions (MIs).

Adarand Decision - The Supreme Court's decision in Adarand Contractors, Inc. v. Pena, 115 S. Ct. 22097 (1995), has confirmed that the federal government can use race-based affirmative action programs to remedy the effects of racial discrimination. According to Department of Justice (DOJ) Post-Adarand Guidance Memo on Affirmative Action in Federal Employment dated March 19,1996, the Supreme Court ruling requires that in order for race or ethnicity to be used for decisionmaking, an agency must have a demonstrable factual predicate for its actions. That predicate could be the agency's interest in remedying the effects of its past discriminatory practices, or effects of employment practices that unintentionally have excluded minorities, or it could be based on the agency's operational needs. Once this predicate is identified, the agency should consider all reasonable means of increasing minority participation in its work force, without specific reliance on racial criteria. However, if such methods are inadequate to meet the agency's legitimate objectives, consideration can be given to racial and ethnic factors.

Under Adarand, such measures must be flexible and fair, accordingly, race can be used as one of a number of factors in evaluating an applicants credentials, but it cannot be the sole factor, or so outweigh all other considerations that it effectively defines who will receive consideration. The use of race-conscious measures also must be limited in duration, lasting no longer than necessary to accomplish the agency's objectives. If the use of the classification is intended to be remedial, it can be targeted only at those groups against whom discrimination has been shown. Finally, consideration must be given to the kind of employment decision that is at issue, and the impact the use of the criteria will have on non-minorities, to assure that the burden will not fall too heavily on innocent parties.

Following the Adarand decision, while reaffirming his own commitment to affirmative action, the President instructed Federal agencies to work with the Department of Justice (DOJ), to ensure that such programs comply with the Supreme Court's test of defensibility. The Justice Department issued a public notice and invitation for comments on the "Proposed Reforms to the Affirmative Action in Federal Procurement" published in the Federal Resister on May 23, 1996. After a thorough review of legislative history and economic and statistical data, DOJ has concluded that there still exists, a compelling need for Federal procurement programs that benefit disadvantaged minority businesses. To that end, DOJ has been working with federal departments and agencies, to propose government-wide regulatory changes, but not elimination, to ensure that procurement programs are narrowly tailored to meet the constitutional standards of Adarand.

Sole Source 8 (a) Programs - Impacts resulting from the call for a three year hold, moratorium or suspension of SBE, DBE, MBE, and WBE set-asides, and of sole source 8(a) contracts are in

need of discussion. As defined by Congress, the 8(a) program is a business development program, that assists firms owned by socially and economically disadvantaged individuals. Eligibility for the 8(a) program is not limited to members of minority groups. DOJ has found that the 8(a) program meets the constitutional requirements of Adarand , and is currently defending the program against several court challenges against the Department of Defense (DOD). According to a NASA Office of Small & Disadvantaged Business Utilization (OSDBU) bulletin dated May 1996, in the case of DynaLantic Corp. v. Department of Defense, a federal district court judge refused to grant a temporary or preliminary injunction to stop a contract under the 8(a) program. Arguing that the 8(a) program was not unduly burdensome to non-8(a) participants, the Government pointed out that non-8(a) firms of contractors, acquire more than 97 percent of all federal prime contract dollars. This was the second straight SDB/Government post-Adarand victory in many months. Nonetheless, the battle against affirmative action set-asides continues, as Congress is presented with another anti-affirmative action legislation that would turn back the clock on the federal government's historic, bipartisan commitment to achieve equal opportunity for all people. Additionally, voters in California will soon decide in November of 1996, on an initiative that would eliminate all affirmative action in California for minorities and women.

Goal Setting to Achieve Set Percentages for Small/Disadvantaged Businesses

The issue of goal setting of a specific percentage rate for participation by small and disadvantaged businesses (SDBs), for the purpose of 'spreading the work around', continues to be of concern to the industry. In spite of the formidable list of federal laws and regulations, including a ten percent (10%) requirement for SDBs, there is a perception on the part of disadvantaged and minority contracting community, that SBEs, DBEs, and WBEs are being 'squeezed or left out' of the procurement process. According to the Minority Business Enterprise - Legal Defense and Education Fund, it has on occasion, found itself regrettably, but necessary to bring legal action against certain governmental entities, and specially private sector firms, for refusing to comply with federal MBE laws or discriminating against MBEs.

Equal Opportunity Contracting Opportunities - According to the National Association of Minority Contractors (NAMC), there is ample data available for identifying industry segments, where there is a shortage in contracting opportunities relative to the number of SDB's, that could be used to set "benchmarks". While it is difficult to investigate or validate such perceptions, currently methods that are being employed to address and ameliorate this situation. In the proposed BART San Francisco Airport Extension turnkey project, there is perhaps the most stringent method used of all the Turnkey Demonstration projects. BART's procurement document, clearly spells out in the percentage rate of the total turnkey contract for DBEs, including 25.6% for minority participation, and 6.9% for female-owned business participation in each trade. In addition, included in each contract, a very stringent liquidated damages clause is clearly spelled out, specifically dedicated to the failure to meet the stated DBE goal.

Similarly, the Los Angeles County MTA (LACMTA) turnkey contract with Catellus Development Corporation dictated in advance during the RFP stage, a set goal for its disadvantaged and women-owned businesses of 25% for various aspects of work, including planning, design, financing, equity participation, construction, management and leasing.

According to LACMTA's DBE Compliance Report, actual DBE participation and utilization on the Los Angeles Union Station Gateway project, met and exceeded the initial goal, with a final outcome of slightly over thirty percent (30%), at a contract amount of approximately $50 million dollars.

Combining Minority and Disadvantaged Goals - There are issues relative to combining of MBE and DBE goals, which has the affect of tainting or hindering business development opportunities among business owners in both classification. Affirmative action programs and related goals are as equally important to women-owned businesses, as they are to minority-owned businesses. There should be support to legislative/regulatory measures, ensuring separate affirmative action goals for women / minorities, in the procurement of public transit contracts, such as in the case of BART which specified a 25.6% for minority and 6.9% for women in its contract document.

Role of Turnkey in Achieving S/DBE Goals

The Turnkey Demonstration projects have distinguished themselves by their inclusion of S/DBE subcontracting in every project. In most cases the Turnkey Demonstration Program projects have exceeded, by more than doubling the Federal goal of ten percent (10%) for S/DBE requirements. Yet, in spite of this impressive show of effort, there continues to be charges and complaints as to turnkey's inclusiveness. In each case study, the issue of commitment or attainment of S/DBE inclusion, was solely due to the firm position on the part of elected officials (city mayors, and city councils, county supervisors) of that particular community, as well as transit board members and their respective staff, to spread the work throughout the entire community. The attainment of the goal for S/DBE inclusion, was directly attributable to the assertive outreach and diligent follow through efforts, by the Board of Directors and agency staff, relative to recruitment, certification, monitoring compliance, or failure of compliance to achievement of the goal.

Access to the Marketplace and Visibility - Professional association and affiliation suggests that number of the small and S/DBE business community are properly "enrolled", and that these firms have "membership accessibility" with the "movers and shakers" in the transit industry. There is an on-going effort by professional associations and transit agencies that sponsor training, outreach and technical assistance programs for S/DBE firms, to participate or receive a higher level of teaming consideration by large firms. Discussions with several members of small and minority businesses suggests that - even with membership with the primary professional associations, such as APTA, ASCE, APA and AIA - small and dis-advantaged firms are continually overlooked, when the time comes to identify eligible firms to participate, or be invited to participate in the Turnkey marketplace.

Subcontracting and Third Party Engagement Issues

The procurement of subcontracts by the respective agency and turnkey contractor, continues to be one of the most difficult and contemptuous tasks, related to the delivery of fixed-guideway transit systems currently under development. In particular, it seems to affect and be affected by such

systems currently under development. In particular, it seems to affect and be affected by such issues as:

- S/DBE Eligibility and Certification Criteria and Standards
- Outreach and Recruitment Efforts, Team Selection and Joint Venturing
- Bid Shopping After Contract Award, and the Use of 'Make or Buy' Program.
- Counting DBE Participation, S/DBE Compliance and Enforcement
- Good Faith Effort, and Recording Requirements

Access to Equal Opportunity, Open and Fair Competition

According to the National Association of Minority Contractors (NAMC), there is a strong need to encourage the type of programs and legislative changes, that facilitates the goals shown below. The NAMC has received the support by passing mutual resolutions for accomplishing these goals, by such organizations as American Subcontractors Association (ASA); Associated Builders and Contractors; and National Association of Surety Bond Providers.

OBJECTIVES:

- Encourage introduction and potentially strategic alliances, between the various groups and construction related business community (large or small, non-minority or minority, small and disadvantaged), through such efforts as Trade Missions, Joint-Venturing and Partnering and Mentor/Protégé Programs;

- Create a forum for sharing information, facilitate the networking opportunities, building bridges between minority firms, parties and entities and large contracting firms, with whom they might need to work. Example of this is the current efforts by Morrison - Knudsen's Strategic Utilization System (STRATUS);

- Provide opportunities for advancing contracting and trade, cross-training, developing and maintaining the highest professional standards, mutually benefiting support, technology transfer and exchange of expertise;

- Provide training programs and education to minority contractors, entities in order to facilitate job creation and employment opportunities, and foster economic empowerment;

- Promote economic and legal interest of small and minority firms by providing access to legislative issues, information access and assistance and training , such as those provided by FTA Office of Small / Disadvantaged Business Utilization (OSDBU), for the purpose of supplying edification and information dissemination of S/DBE qualified firms available in a particular region.

Qualified Subcontracting Firms - There is a perception that finding qualified and professional small and minority firms to do subcontracting work is difficult. The FTA OSDBU can provide a list of qualified and professional small and minority firms that can provide design, engineering and construction support. In addition most public agencies offices of EEO or Civil Rights can provide such lists. In the case of Los Angeles Union Station Gateway project, the LAC-MTA had provided Pankow Builders a list of S/DBE qualified to do the work. Pankow, on its own, conducted a comprehensive outreach effort and significantly increased this list of minority and disadvantaged businesses. Pankow met and exceeded the goal of 25% DBE goal set by the project requirements.

Bidder Flexibility Regarding Inclusion of Small and Disadvantaged Businesses - Issues have been raised as to the flexibility of the bidder to incorporate S/DBE elements or requirements in its bid documents, or following the selection of the contractor/ team, and after the contract has been signed. This issue has been adequately addressed by BART and LACMTA in the San Francisco Airport Extension and the Los Angeles Union Station Gateway projects respectively. In both instances, DBE inclusion was a mandatory requirement clearly spelled out in RFPs and Development Agreements and/or Contracts. Furthermore, FTA is in the process of releasing a new Circular, calling for the inclusion of DBEs to be identified up front by the bidder.

Identifying and Certifying Small and Disadvantaged Businesses - There is a perception that finding and certifying S/DBE entities is a difficult and long process. Opportunities exist under the rules of 49 CFR Part 23 - Part II of US DOT (participation of DBE in federal programs) and 49 CFR Part 23 - Part VI of US DOT (participation of MBE in BOT programs), both clearly spell out requirements for S/DBE certification and the process to be followed. Agencies or owners that have not done so, should contact FTA's OSDBU for eligibility and certification guidelines, in order to establish an updated list of such firms that is available and readily usable. The LACMTA hired a minority firm to develop and certify minority and disadvantaged firms for the Union Station Gateway project. This firm conducted a thorough outreach with Pankow Builders to develop and accept the list, validate and certify each firm that is capable and qualified to do the various type of jobs required of them.

Utilizing Small and Disadvantaged Businesses in Various Phases of Procurement - Small and minority firms are not always included in all phases of transit development. The Turnkey Demonstration Program projects have distinguished themselves, by insuring that small and disadvantaged businesses are thoroughly involved in all phases of transit procurement. These include mandates by the turnkey contractor to incorporate such firms in the planning, design, architecture, engineering, financing, construction, management and leasing thereof, as was the case with BART's San Francisco Airport Extension and Union Station Gateway in Los Angeles. Both of these projects incorporated language into the Development Agreements, insuring the inclusion of all types of firms in all aspects of the planning, design and construction phases. BART has also gone so far as to require DBE contracts to be segmented into different categories of work along the contractor goals.

Involvement of Small and Minority Firms in Joint Venture Partnerships - There is a perception that small and minority firms are not well represented in key joint venture

partnerships, and the large firms do not venture with DBEs. A new awareness needs to be instilled for the opening of doors by potential corporate partners, regarding the advantages and benefits of utilizing a diversity program.

Monitoring and Compliance Issues Relative to DBE Requirements - Major shortcomings and challenges are presented to public transit agencies in regards to monitoring the compliance to the DBE requirements in the contract, accomplishment of stated DBE percentage goals, what counts as DBE participation, especially when it comes to second and third tier subcontractors. This is particularly true where design and preliminary engineering has not been completed prior to the release of solicitation documents. There is a need for maintaining excellent documentation on the use of S/DBE firms for the purpose of goal attainment and other labor related compliance issues. Los Angeles MTA contracted yet another minority firm to accomplish these two important issues. BART required the turnkey contractor to provide their own DBE compliance officer to liaison with BART's Affirmative Action Department. BART has also decided to require the turnkey contractor to provide BART in advance as to when a DBE subcontractors are coming aboard. All current agencies involved in this current round of Turnkey Demonstration Program have embraced assertive recordation procedures, including those related to training subcontractors as to their record keeping for DBE compliance.

As a means to insure DBE compliance, agencies are writing into the contract stringent liquidated damages clause for penalties to be paid by the turnkey contractor to the agency, in the event DBE compliance has not occurred or DBE goal percentages have not been met. If carried to the extremes, the damages could exceed the total dollar value of the DBE / WBE goals. Some might question the magnitude of the assessments as penalties, and question its use for these purposes, but thus far there is not any known challenges that we know to this use.

Unfair Business Practices - The Minority Business Enterprise Legal Defense and Education Fund (MBELDEF), has raised issues that stem from predatory business practices and unfair abuses,on part of prime contractors or turnkey vendors, as it relates to payment schedule 'slow or no pay', substitution of subcontractors, or 'sub-busting', 'fronting' , 'bid shopping', release of retention, 'striker replacement' tactics. Opportunities exist to alleviate and ameliorate the said problems by federal agencies and individual grantees.

Opportunities: Legislation which expands the Prompt Payment Act, to cover federal grantee programs and those affording contractors on state / local projects, the same protections as they currently receive on the federal level, can be supported. Cash flow management problems for small and disadvantages firms can be greatly relieved by increasing payment schedule, from once to twice a month as in BART's case.

Opportunities: Discourage 'bid shopping' by incorporating strong 'make or buy' clauses in the procurement contract. While the Liquidated Damages may withstand a court challenge, it is suggested that a tightly controlled 'make or buy' based on incentives/disincentives program, would accomplish the same result or goal, and yet likely to be less vulnerable to challenge. This is another name for how much of the contract is to be subcontracted out, and to whom. The solicitation can spell out the percentage goals in all areas, including DBE and WBE, and sets a

solicitation can spell out the percentage goals in all areas, including DBE and WBE, and sets a requirement that no changes occur Without the Written Authority of the owner.

Impacts of Federal Laws and Mandates on DBE Concerns - There is concern about specific provisions in the Federal Procurement Reform Act that might curtail third party contracting opportunities for minority contractors. Issues raised include: contract determinations below the simplified acquisition threshold; timely notification on bid opportunities; and fair provisions under proposed bid protest changes. Affects of a low threshold contract limit mandated by the Bacon-Davis Act is also considered an issue. The relatively slow pace of minority advancement in private sector, particularly in light of the fact that the private sector has never been impacted or burdened by Davis-Bacon Act. Supporting the reform of the Davis-Bacon Act to raise the threshold from as a means of opening doors for increased small and minority business participation in public sector jobs, while maintaining wage protection laws under the law, would be an opportunity. The ability to circumvent the Miller Act by contracting officers, by pricing contracts above the Simplified Acquisition Threshold (SAT), could also be addressed. Supporting the increase of the SAT to $100,000 under the Federal Acquisition Streamlining Act (FASA). Discourage the implementation of alternate payment protections for contracts below the SAT, without guarantees that the ultimate affect will not close opportunities for small and minority business enterprise.

Effects of Electronic Procurement - The Federal Acquisition Streamlining Act of 1994, advocates changes away from paper-based to on-line procurement. This will undoubtedly affect firms that have not already, or are incapable due to financial constraints to participate in the electronic contracting procedures. Support the appropriation of funds to facilitate access by, and training for, small and disadvantaged business enterprises in order to be incorporated in the Federal Acquisition Computer Network (FACNET) program, thus making federal procurement opportunities more accessible.

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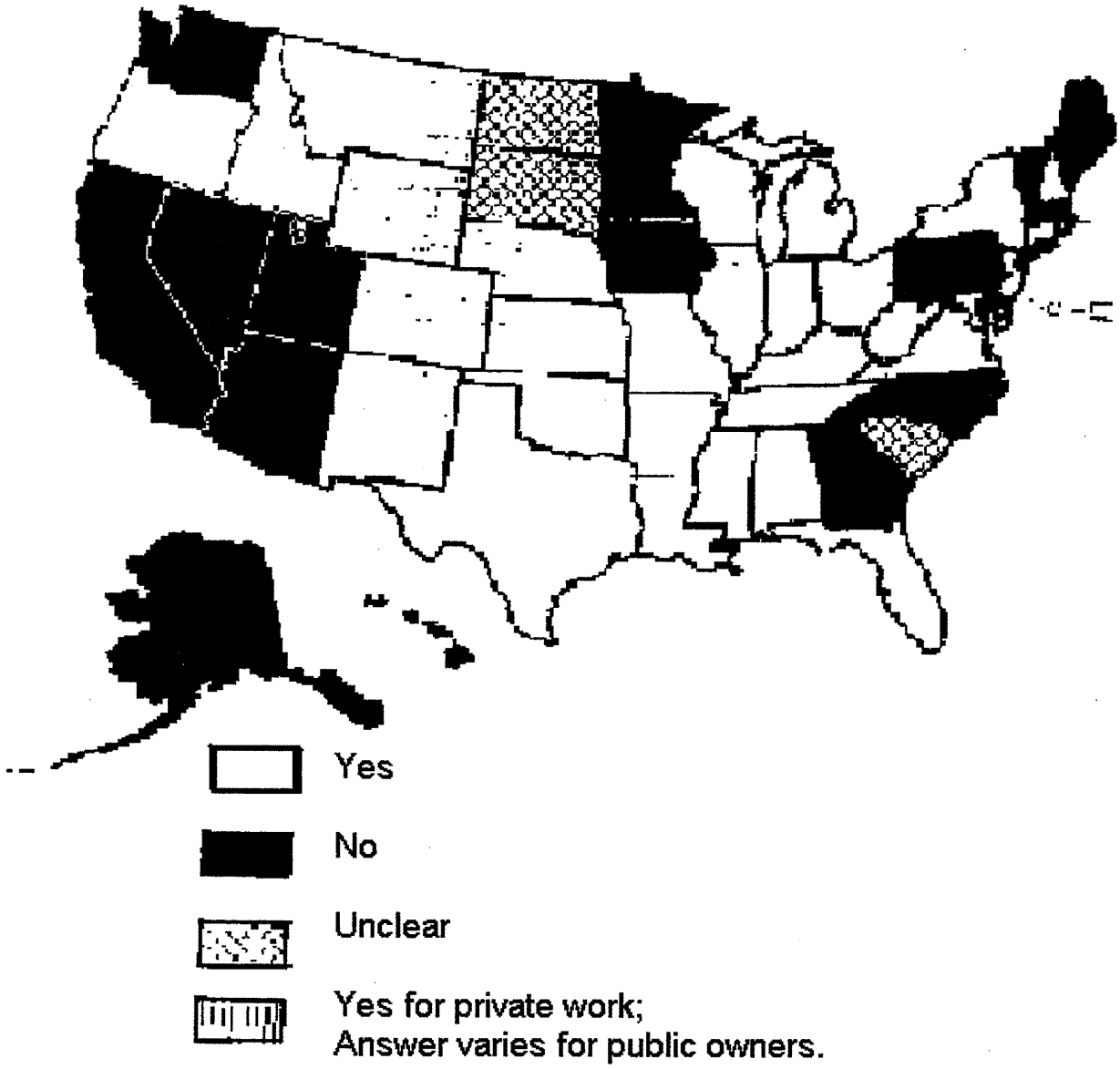
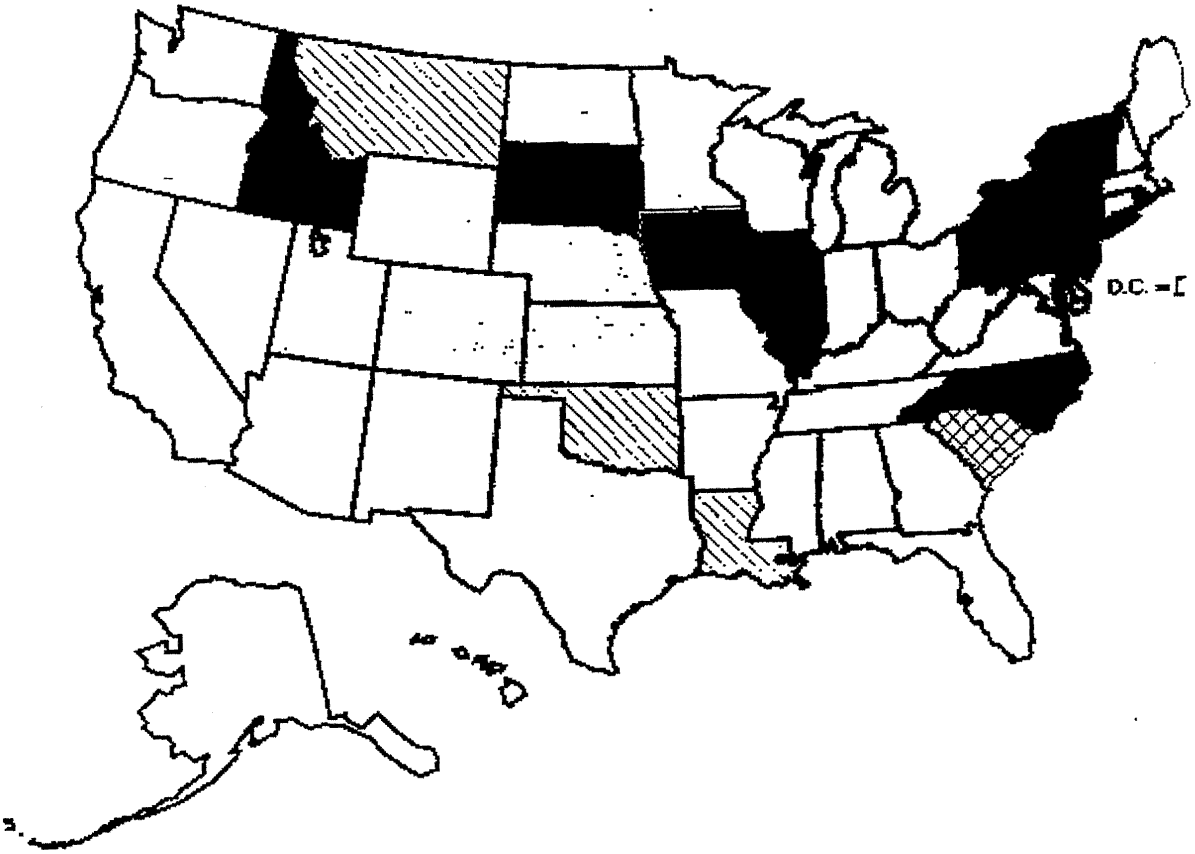
APPENDIX A.

Map 1: Q. Can a professional design corporation, organized and licensed in accordance with relevant state laws, perform, design/build work with its own forces under a direct contract with an owner?



Map 2: Q. Can a general contractor, organized and licensed in accordance with relevant state laws, perform design/build work with its own work forces under a direct contract with an owner?



Yes

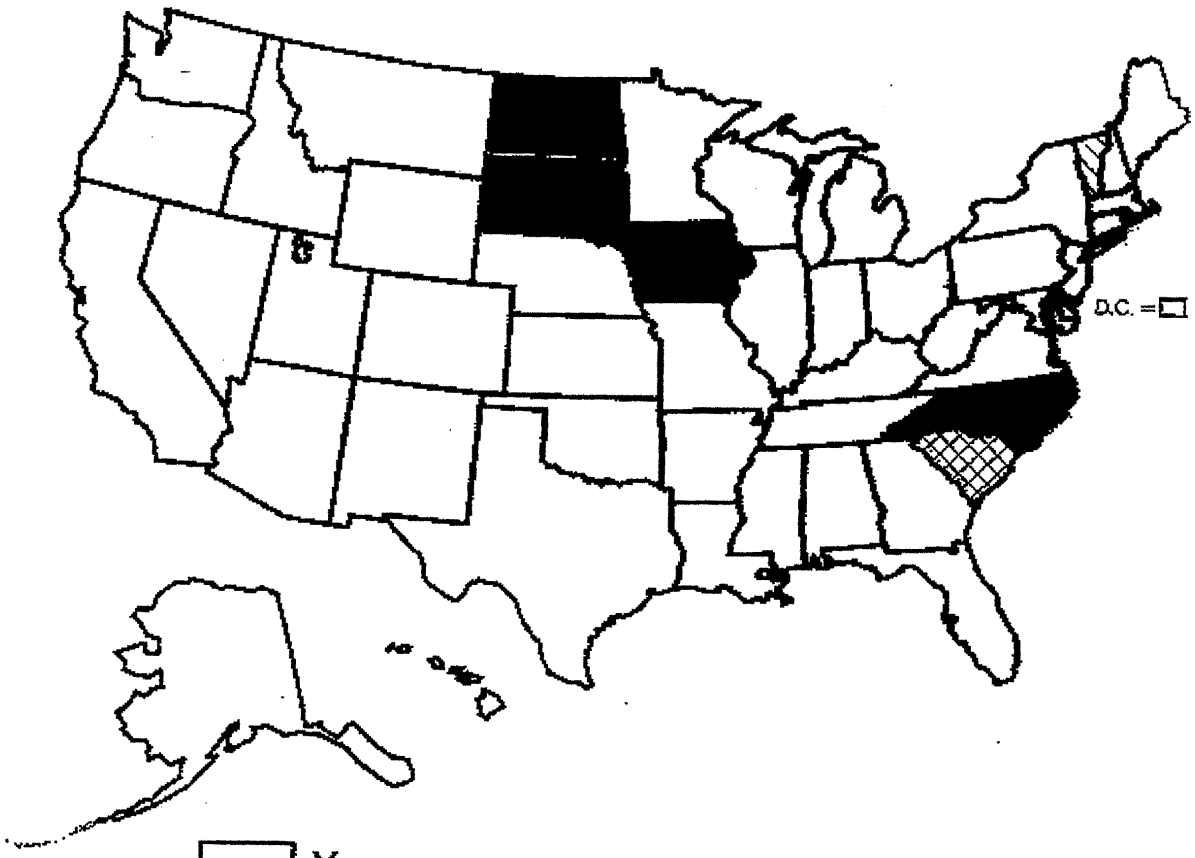
No

Yes, where design is architectural work;
No for engineering work.

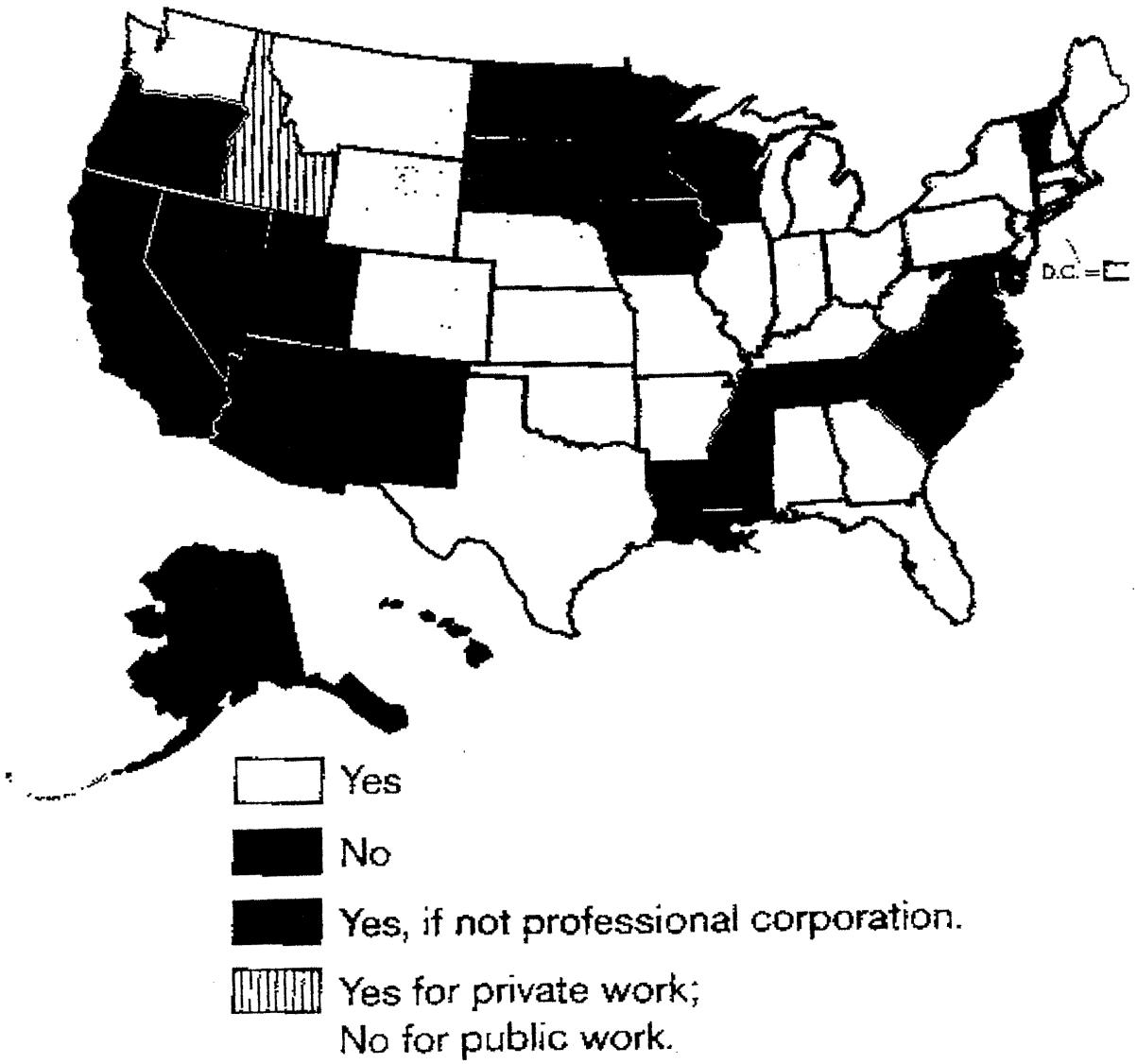
Yes for private work;
Answer varies for public owners.

Unclear

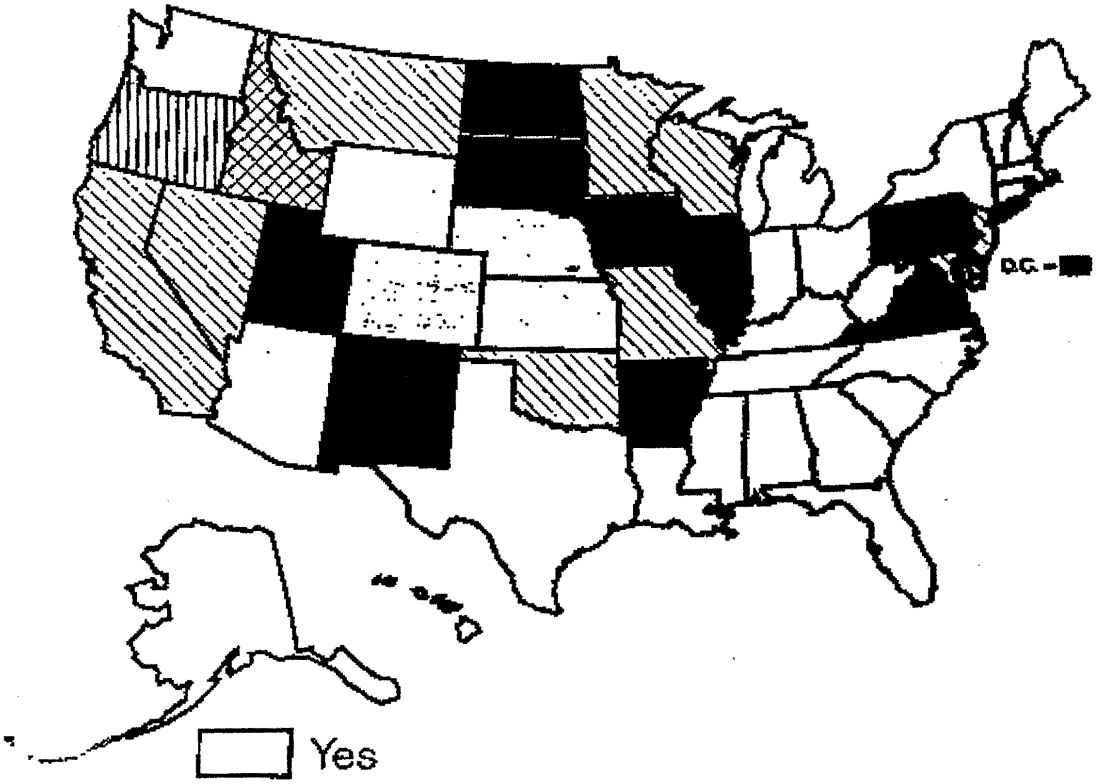
Map 3: **Q. Can an engineering constructor, such as the company outlined in our hypothetical, which is organized and licensed in accordance with relevant state laws, perform design/build work with its own forces under a direct contact with an owner?**



Map 4: Q. Is a design firm which does not hold a contractor's license permitted to enter into a design/build contract with an owner and subcontract the construction work to a general contractor?



Map 5: Q. Is a general contractor, which is not licensed to practice architecture or engineering permitted to enter into a design/build contract with an owner and subcontract the design work to a design firm?



Yes

No

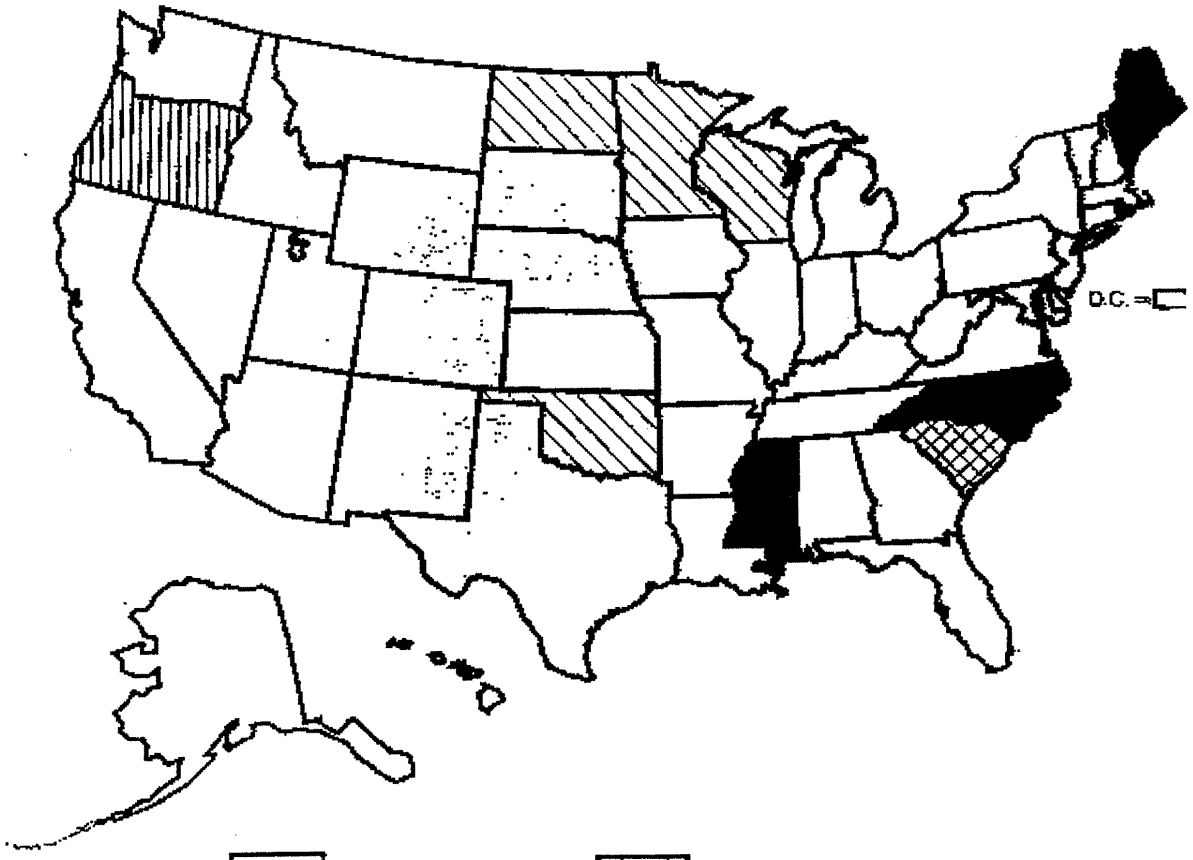
Unclear

Yes for private work;
No for public work.

Yes, where design is architectural work;
No for engineering work.

No, where design is architectural work;
Yes for engineering work.

Map 6: Q. Are design firms and general contractors permitted to form joint ventures to perform design/build work?



Yes

Unclear

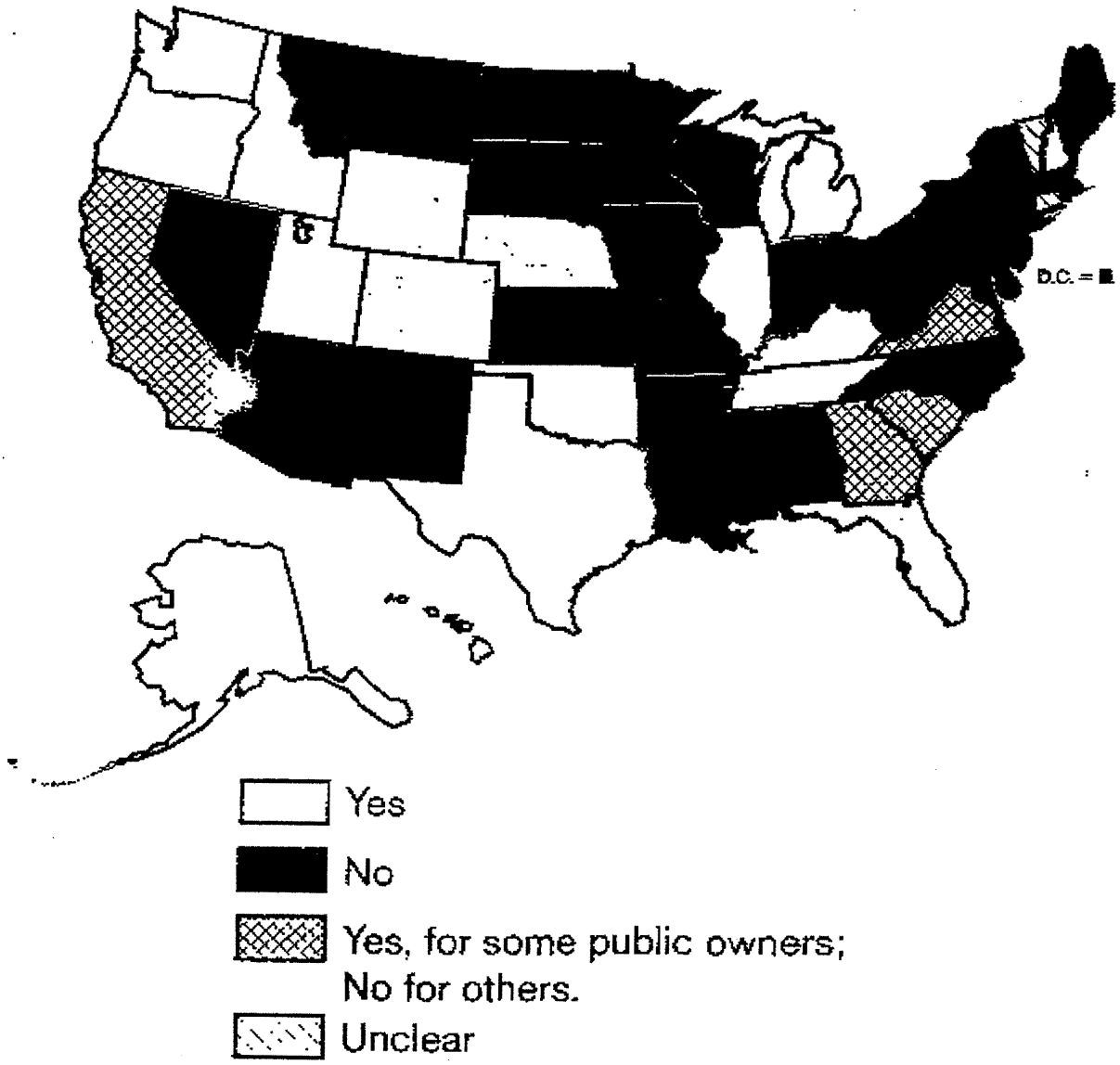
No

Yes, where design is architectural work; No for engineering work.

No, where design is architectural work; Yes for engineering work.

Yes for private work; Answer varies for public owners.

Map 7: Q. Are public owners authorized to utilize the design/build method of project delivery?



PART VI

ENVIRONMENTAL CONSIDERATIONS

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ENVIRONMENTAL CONSIDERATIONS

BRW, Inc.

ABSTRACT

This paper discusses how environmental and community issues affect project planning and development, and presents ideas on how to proactively manage the environmental compliance process to capitalize on the flexibility and advantages of a turnkey approach while reducing the potential for major project risk factors to jeopardize successful project implementation. Based on experiences of traditional and turnkey projects during the project development process, major project risk factors associated with environmental issues are explored. Major project risk factors (cost risks, delay risks and public relations risks) associated with environmental issues need to be identified and acknowledged as early as possible in the project development process. Mechanisms to compensate for these risk factors need to be developed and incorporated into the design of the turnkey procurement process. Assigning responsibility for environmental management functions to the parties who are best equipped to resolve the issues likely to arise at each stage of the development process also is important. Proactive environmental management has the potential to support the turnkey concept, by reducing the risks associated with environmental issues. Reactive environmental management exposes projects to high levels of risk and has the potential to jeopardize attainment of turnkey objectives.

PURPOSE AND INTRODUCTION

Consistent with the trends which evolved in the 1930's, under the Urban Mass Transportation Act of 1964 the construction of new fixed guideway transit systems in the United States continued to be predominantly the domain of government public works projects instead of the pursuit of private enterprise. Under what has evolved as the "traditional" procurement process over the last three decades, fixed-guideway transit investments are typically managed from conception to operation by a public agency "owner." In the traditional procurement process, the owner maintains the responsibility - and the risk- for all phases of implementation, serving as a coordinator for project development activities across multiple contracting entities.

The major environmental law governing the planning of federally funded transportation improvements, the National Environmental Policy Act (NEPA), was enacted in 1969. NEPA has been integrated into the traditional procurement process by U.S. DOT implementing regulations (23 CFR Part 771) as a decision-support tool to ensure that effects on social, economic and environmental (SEE) factors are considered during the project development process. The potential effects of proposed investments on SEE factors are addressed in one of three types of NEPA documentation dependent upon the magnitude of impacts anticipated and the complexity of the context in which the improvements are proposed: Environmental Impact Statements (EISs), Environmental Assessments (EAs) or Categorical Exclusions (CEs). The NEPA process concludes with environmental findings (e.g. Record of Decisions, Findings of No Significant Impact) by the federal sponsoring agency, upon which funding for final design can be released. As a planning tool, NEPA provides a holistic framework in which to develop transportation improvements which are integrated into the fabric of the host communities and which are supportive of community planning goals. In addition, NEPA provides opportunities for the public to obtain information on and participate in the planning of federally funded undertakings.

The Intermodal Surface Transportation Efficiency Act (ISTEA) has stimulated interest in the pursuit of innovative financing techniques and public-private partnerships, and is changing how transportation planners and engineers think about the procurement of transportation improvements. ISTEA has increased and enabled agency and private industry participation in "turnkey" procurement, which is defined in the Act as *"a project under which a [grant] recipient contracts with a consortium of firms, individual firms, or a vendor to build a transit system that meets specific performance criteria and which is operated by the vendor for a period of time."* Under a typical turnkey procurement, a transit agency would contract with a single entity responsible for managing delivery of the desired system, eliminating or reducing the need for the agency owner to act as the coordinator between the project designer and the construction contractor. The potential benefits of this approach - more appropriate allocation of risks, reduced costs, accelerated project development, improved project control, access to new funding sources, and reduced agency staffing needs - will ultimately result in a more efficient use of federal funding through improved planning processes.

In developing new approaches to transportation investment and altering the traditional roles of the private sector and the public owner of the project, it is appropriate to explore how the primary goal of NEPA - the preservation of environmental quality for future generations - can be best

achieved during transportation decision-making while supporting the objectives of the turnkey concept. This paper explores the following questions:

- What are the potential differences between environmental compliance processes in a traditional procurement versus a turnkey procurement? What implications do these differences hold for the delivery of transportation improvements?

- What can we learn from recent experiences in both traditional and turnkey procurements to reduce the risk of conflict and delay resulting from environmental management and community relations problems during turnkey project delivery?

- How can the approach to environmental compliance under NEPA and other environmental laws be tailored to support the objectives of turnkey project procurement, including maximizing joint development opportunities?

In exploring answers to these questions, this paper also addresses several major environmental management issues identified by federal agencies, project sponsors and turnkey contractors:

- the timing and extent of turnkey contractor participation in addressing environmental requirements;

- the relationship between the project type, the likely environmental considerations, and the selection of a procurement strategy;

- the appropriate allocation of risks and costs related to uncertainties associated with environmental issues and public demands; and

- the appropriate responsibility for resolving environmental issues and completing compliance activities, and monitoring and maintaining mitigation commitments.

The potential roles of the participants in addressing environmental issues in a turnkey project are discussed. The paper also makes recommendations on how proactive environmental management can be used to support turnkey procurement objectives. Opportunities for improved environmental management afforded by the turnkey procurement process are also explored.

The paper begins with an overview of the relationship between environmental issues and the project development process. Next, traditional and turnkey procurement options are compared in light of the roles and responsibilities in addressing environmental issues. Environmental management issues raised by non-traditional procurements and the potentially different roles and responsibilities are then discussed, followed by a review of "lessons learned" from both traditional and innovative procurements. The paper concludes with recommendations on how environmental issues can best be addressed during turnkey procurements, and how sound environmental management principles can support the objectives of the turnkey program.

ENVIRONMENTAL ISSUES IN THE PROJECT DEVELOPMENT PROCESS

Federal planning regulations and guidance outline a multi-step process to develop a major transportation investment involving federal funds. The process is intended to be flexible and non-prescriptive in nature, and represents an open, explicit and replicable basis for transportation problem solving. If followed as intended, this approach affords local policy-makers a cohesive framework for a reasoned approach to decision-making which reduces the risk of project delays and increased costs. The process is designed to provide appropriate information to support the sequential decisions which must be made in moving from a general definition of transportation problems in an urban area to the construction and operation of a specific project to serve identified regional needs. Although the general planning process and the issues addressed at each step would not vary significantly with alternative procurement strategies, the responsibilities for the work and the sequencing of work could change. This change in responsibilities and sequencing - i.e., who is doing the work, what are their primary motivations, and how the work is timed - has the potential to alter the predominant values and thus the priorities driving the completion of each phase of work.

At each step of the development process, the definition of the project is specified at increasing levels of detail. At the same time, more comprehensive information on the potential effects of the project on the natural and man-made environment is prepared. Transitioning from one step in the planning process to the next also necessitates commitments from an increasingly broader range of local, state, regional and federal agencies as well as other interested parties. Because each step requires higher levels of effort and financial commitment than previous steps, and because the cost and schedule impacts of reversing or revisiting earlier decisions increase over time, the commitment to proceeding with a project as defined should be increasingly firm as the project proceeds through the process. It is important that SEE factors with the potential to influence the choice among alternative mobility solutions, the cost of the solution, and the schedule for implementation be identified as early as possible to avoid unexpected and unwelcome "surprises" which could adversely affect project implementation or viability.

The following description of the project definition, environmental considerations, and policy aspects of each of the major steps in the project development process provides a basis for considering the cost, schedule and political risks encountered as a project proceeds through the planning process. As in the traditional procurement process, under the various turnkey procurement options, the assignment of these risks to the entities most capable of managing the risk is an important element in overall project success. The major steps discussed are:

- System Planning
- Major Investment Study
- Preliminary Engineering
- Final Design and Right-of-Way Acquisition
- Construction
- Operation

For both traditional and turnkey procurements, the earlier in the overall process that environmental issues are identified and resolved through proactive management, the more control the project sponsor retains over project schedule and budget. Environmental issues also should be considered at an appropriate level of detail throughout each step in the project development process. While important in traditional procurements, proactive and early resolution of environmental issues is even more important in turnkey procurements for several reasons. First, uncertainties associated with pending environmental issues represent risks to the contractor, which will be translated into increased costs to the project sponsor. Second, because turnkey procurement facilitates concurrent as opposed to sequential work flow, the potential for delay damages while environmental "surprises" are resolved is increased. Finally, in a turnkey procurement the greatest flexibility in project definition exists at the design process. Late changes in project definition can erode some of the desired goals of turnkey procurement related to controlling scope, reducing change orders and improving project control.

System Planning

The system planning step typically takes about 12 months to complete. The the level of effort needed and the cost of system planning can vary widely depending upon the size of the metropolitan area, the scope of improvements to be considered and the level of detail of the analysis.

Project Definition

This initial step in the project development process involves an evaluation of region-wide transportation needs and a very preliminary assessment of the kinds of transportation improvements that may be appropriate in a number of travel corridors. Travel corridors in which major investments in transportation may be justified are identified and priorities for investment are established. The travel corridor or corridors which should proceed to the next step in the project development process may also be identified. The Long Range Transportation Plan is prepared or updated for the metropolitan area upon completion of System Planning.

Environmental Considerations

The Long Range Transportation Plan resulting from System Planning must be shown to conform to the requirements of the Clean Air Act Amendments. Major environmental issues may be considered in identifying corridors for potential major transportation investments. The analysis typically focusses on identifying and avoiding those critical environmental issues which are of such extraordinary magnitude that future project implementation would be extremely costly, severely impeded or even precluded. SEE factors with the greatest potential to become "showstopppers" typically include large numbers of property displacements, wetlands and water resources, endangered species habitat, archaeological/historical resources, parklands and contaminated materials. Although environmental screening can be an integral part of this step, formal initiation of compliance with the National Environmental Policy Act (NEPA) is typically

deferred until specific corridor improvements have been more narrowly defined in subsequent phases of the project development process. In some instances, however, the NEPA process can provide a rational framework that can be used to structure the decision-making process.

Policy Commitment

The Long Range Transportation Plan must be affordable within reasonably expected levels of funding for transportation improvements. The Plan must be adopted by the designated Metropolitan Planning Organization (MPO), and updated at regular intervals. In adopting the Plan, the MPO identifies the level and sources of funding which are likely to be available to implement major transportation projects. Any project which receives federal funding must be included in a "conforming" long range plan. A Plan is "conforming" when it is found to be consistent with and meets the requirements of the Clean Air Act Amendments.

Major Investment Study

The MIS phase typically takes 12 to 24 months to complete, depending upon the complexity of the transportation problems to be solved, the characteristics of the corridors in which improvements are contemplated, the number of alternatives being considered, and the level of controversy regarding the potential transportation solutions. Because of the aforementioned factors, budgets for MIS completion vary widely, but can typically range from between ½ to one percent of the construction cost of the improvements envisioned.

Project Definition

A range of alternative solutions to the transportation needs identified in the subject travel corridors are evaluated in a Major Investment Study (MIS). The product of a MIS is a definition of the design concept and scope of a multi-modal strategy for addressing mobility and accessibility needs in the corridors. The strategy can consist of a single improvement, or a "solution set" composed of several projects. Engineering design for proposed improvements is typically completed to between five and 10 percent of complete final design. The project definition includes the mode or modes to be developed and the service levels to be provided, a general alignment (to within about 10 to 50 feet), preliminary identification of major right-of-way needs, identification of major structures, and a preliminary definition of station or access locations and provisions for passenger access to the stations (for solutions which involve stations). Cost estimates are typically prepared with continency levels of 15 to 25 percent. The results of Major Investment Studies are then incorporated into an update of the Long Range Plan for the region to include the refined definition of the investment.

Environmental Considerations

The project development process offers two options for integrating NEPA activities with the MIS process. Option 1 calls for the preparation of NEPA documentation after completion of the MIS

report and the selection of a locally preferred strategy. Option 2 involves preparation of NEPA documentation concurrent with the MIS report and prior to selection of a locally preferred strategy.

The actual planning process followed under both of these options, the environmental work to be performed and the types of decisions to be made are ultimately the same. The primary difference between these two options relates to the timing of the documentation of impacts to SEE factors and how those impacts will be avoided, minimized or mitigated. The level of detail included in the Draft Environmental Impact Statement (DEIS) or Environmental Assessment (EA) under Option 1 or Option 2 is influenced by the timing of preparation of the DEIS or EA.

Because the documentation is prepared following the selection of a preferred strategy, under Option 1 the DEIS would typically address fewer alternatives in greater detail. Because the document is prepared prior to the selection of a preferred strategy, under Option 2 the DEIS would typically address a greater number of alternatives in less detail. Although under Option 1 the NEPA process is not formally initiated until after the conclusion of the MIS and the identification of a locally preferred strategy, the basis for the selection of the preferred strategy, including the potential effects on SEE factors, is documented to the extent necessary to differentiate among alternatives. Under Option 2, if the level of project definition available during the MIS is not adequate to support resolution of impacts to SEE factors in the DEIS, subsequent design activities may reveal a need to revisit key issues through supplementary environmental documentation.

For corridors where improvements under consideration are unlikely to have significant effects on SEE factors or environmental issues are easily resolved, Option 1 can streamline the evaluation process by deferring the preparation and circulation of NEPA documentation until a more focussed "project" has been identified. In corridors where the improvements under consideration have a greater potential to adversely impact SEE factors, Option 1 entails risks that subsequent environmental analysis during the course of the NEPA process will uncover issues that could influence the decisions reached in the MIS. The risk of revisiting the conclusions of the MIS process is heightened if the resolution of major community or environmental issues identified during the study process are deferred to later phases of the project development process. For environmentally complex corridors, Option 2 affords the opportunity to reduce environmental uncertainties and the risk of revisiting decisions by initiating the preparation of NEPA documentation concurrently with the MIS.

Policy Commitment

The MIS is intended to be a collaborative decision-making process. The MIS should result in conceptual agreement on the investment strategy among all of the affected agencies and the public. The commitment of regional policy-makers is reflected in the adoption of the required amendments to the Long Range Transportation Plan. The MIS should also seek conceptual agreement from local governments, transportation agencies, resource protection agencies and affected communities with respect to the anticipated effects of the preferred investment strategy on transportation service, adjacent properties and SEE factors. A comprehensive and proactive

public and agency involvement process during the MIS can reduce the risk of future design concept changes and enhance the commitment for the project as it proceeds through the development process. An important component of such an outreach program is ensuring that sufficient information on environmental issues of public concern is available at the level of detail necessary to reach resolution on areas of controversy.

Preliminary Engineering

Preliminary Engineering typically takes between 12 and 18 months and costs approximately 3 to 4 percent of the total project budget. Additional costs can be expected for environmental documentation prepared at this stage of the process. The EA process typically takes between 6 to 12 months, while the EIS process can be expected to take 18 months, inclusive of public review periods.

Project Definition

The preferred investment strategy identified in the MIS is developed to the 30 to 35 percent level of engineering design. The alignment and profile of the project is defined (to within about two feet), locations for stations and other major facilities are confirmed, and station area plans are prepared. Geotechnical and hazardous materials investigations are conducted and property ownership is mapped to guide the design process. An operating plan is developed, vehicle requirements are determined, and the provisions for passenger access to the system (bus access, pedestrian access and parking) are finalized. The right-of-way needed to construct improvements and the utilities which must be relocated are identified and measures to mitigate unacceptable adverse impacts on SEE factors are defined. Engineering design criteria or performance specifications are prepared for the guideway, vehicles, stations, maintenance facilities, roadway improvements, and control systems.

After receiving comments following the public distribution of the Draft Environmental Impact Statement (DEIS) or Environmental Assessment (EA), required changes to the design and additional mitigation measures are incorporated into the plans. Cost estimates are updated, and the additional detail in engineering information allows the contingency level to be reduced to about 10 percent. During Preliminary Engineering, careful consideration of how the proposed improvements relates to the natural and social context, combined with securing the endorsement of affected property owners, communities, and agencies will reduce the risk of required design changes during future stages of the project, providing sponsors with better control over project schedule and costs.

Environmental Considerations

Under Option 1 for the MIS, the DEIS or EA is prepared during this stage of project development. Some project sponsors complete the DEIS in the early stages of Preliminary Engineering, and continue with design activities during public circulation and review of the

document. Under Option 2, the DEIS prepared during the MIS is reviewed to determine if supplemental documentation is required.

Concurrent with the completion of Preliminary Engineering, public comments resulting from the circulation of the DEIS are addressed, design modifications to address issues raised are incorporated into the plans, and preparation of the Final Environmental Impact Statement is initiated. The NEPA process is concluded with a final determination by the federal sponsoring agency, after which funds for final design can be released. The EIS process concludes with the issuance of a Record of Decision (ROD) on the FEIS. The EA process concludes either with a determination that an EIS is required (when impacts are found to be significant), or with a Finding of No Significant Impact (FONSI).

Policy Commitment

Preliminary engineering is the critical step in obtaining community and agency support for the project because it provides the detail required to assess the impacts of the project on the community, and to clearly convey the proposed design elements to the project's stakeholders. The high costs of subsequent final design work and the potential delays associated with revisiting environmental issues and documentation make firm commitments particularly important during preliminary engineering. Required zoning approvals, Public Utilities Commission clearances for safety elements, endorsements by local governments, concurrence from resource agencies on mitigation treatments and commitments for in-kind improvements should all be in place prior to the start of final design. Commitments of local funding must be in place, and a full-funding grant agreement is negotiated between the federal funding agency and the project sponsor after the conclusion of preliminary engineering.

Final Design and Right-of-Way Acquisition

Project Definition

Working from the design criteria and project definition produced in Preliminary Engineering, construction documents are prepared for the project. Detailed specifications for equipment are prepared and materials to be used in construction are identified. Requirements for maintaining traffic, access to properties and other limitations on the construction process (such as hours during which construction must be scheduled) are defined. Procurement of some long lead time elements of the system may proceed using performance specifications. Suppliers then develop detailed designs prior to the manufacture and assembly of the final products.

The properties required for the project are acquired through negotiations or condemnation. Due diligence investigations are conducted regarding each required property. Required dedications of public lands are completed. Formal agreements among public agencies are executed.

Environmental Considerations

Necessary environmental permits are obtained for the project, based on the final design definition. Conditions of the permits are reflected in any necessary design changes. The design should be monitored to confirm that environmental impact and avoidance and mitigation commitments made earlier in the project development process are reflected in the construction drawings.

Policy Commitment

Continued public and agency outreach activities should be conducted to provide continued guidance to the design process and to maintain public support for the project. Continued agency outreach should occur to identify infrastructure and land development changes which may impact design or construction.

Construction

Project Definition

As construction proceeds, unforseen conditions may require changes to the construction plans. Construction process and schedule refinements will be developed at the outset of the project and as construction proceeds. The contractor may also identify design or construction process changes to reduce costs or shorten the schedule. Changes are evaluated on a continuing basis. Partnering can be used to establish cooperative working relationships and to convey important information regarding environmental and community commitments to the construction team.

Environmental Considerations

Construction-related permits are obtained and, if necessary, special conditions relating to environmental features are attached. Environmental commitments identified in the NEPA documentation and in permits are field-monitored.

Policy Commitment

As construction proceeds, the project is closely coordinated with local public works officials, utility companies, safety agencies and adjacent property owners. Outreach efforts and continued commitment to partnering among participating parties can minimize conflicts.

Operation

Project Definition

Once the project is complete and operation is underway, refinements to the operating plan and minor modifications to the facilities are made on a continuing basis. Operating policies continue to evolve, especially when the project involves interfaces with crossing traffic and pedestrian routes.

Environmental Considerations

Any required construction activities in response to operational needs are assessed for environmental coordination needs and are monitored for compliance with previous environmental commitments. Permits for operational activities are maintained. Periodic environmental audits are conducted to ensure that operations are conducted in compliance with applicable laws and that compliance procedures are efficient and streamlined.

Policy Commitment

Continued public outreach activities can be used to reduce conflicts with neighborhoods and businesses, especially when operational changes could influence the impacts of the project (such as noise resulting from modified warning devices or procedures at street crossings). Resolutions are adopted as necessary to commit to changes in operating procedures to mitigate impacts.

OVERVIEW OF PROCUREMENT PROCESS OPTIONS AND ENVIRONMENTAL MANAGEMENT RESPONSIBILITIES

In both traditional and turnkey procurements, several key environmental management functions need to be performed over the course of the project development process. These are:

- Impact Assessment and Preparation of NEPA Documentation
- Mitigation Design
- Environmental Process Risk Management
- Procurement of Permits
- Environmental Compliance Monitoring
- Construction Period Outreach
- Evaluation of Late Design Change Environmental Effects

The roles and responsibilities of U.S. DOT, the owner, and the turnkey contractor under various procurement scenarios are summarized in Table 1 and discussed below, based upon what has been proposed or has occurred in the recent past.

Traditional Procurement

Under the traditional procurement process, the agency owner retains responsibility for all environmental functions, including preparation of the NEPA documentation. Along with U.S. DOT, the agency owner participates in the monitoring of contractors to ensure environmental compliance.

Limited Turnkey Procurement

As in the traditional procurement process, the agency owner retains responsibility for all environmental functions. This approach allows the owner to secure some of the benefits of a turnkey procurement while maintaining total control (and associated risks) inherent in resolving environmental issues.

Turnkey Procurement

Under a turnkey procurement, environmental management responsibilities typically are shared between the owner and the turnkey contractor, providing a system of checks and balances. Environmental functions which have been or proposed for transfer from the owner to the turnkey contractor include the procurement of environmental permits, community outreach during construction, and evaluation of environmental consequences of design changes. While the agency owner still retains control of the initial impact assessment and design of mitigation measures, control over the assessment of the environmental consequences associated with design changes is diminished. Because the owner is no longer serving as the multi-disciplinary

TABLE 1. TYPICAL ROLES AND RESPONSIBILITIES

Environmental Managment Functions	Who Completes NEPA Process?	Who Designs Mitigations?	Who Determines Sharing of Costs/Risks?	Who Obtains Needed Permits?	Who Monitors Environmental Compliance?	Who Conducts Construction Impact Outreach?	Who Evaluates Late Design Change Environmental Impacts?
Traditional Procurement	Owner, for U.S. DOT	Owner	Owner	Owner	Owner and U.S. DOT	Owner	Owner
Limited Turnkey	Owner, for U.S. DOT	Owner	Owner	Owner	Owner and U.S. DOT	Owner	Owner
Turnkey	Owner	Owner	Owner	Turnkey Contractor	Owner and U.S. DOT	Turnkey Contractor	Turnkey Contractor
Super Turnkey	Owner	Owner and Turnkey Contractor	Owner and Turnkey Contractor	Turnkey Contractor	Owner and U.S. DOT	Turnkey Contractor	Turnkey Contractor
Four-Phase Turnkey	Owner with Input from Turnkey Contractor	Turnkey Contractor with Input from Owner	Turnkey Contractor and Owner	Turnkey Contractor	Owner and U.S. DOT	Turnkey Contractor	Turnkey Contractor
Franchise	Turnkey Contractor with Input from Owner	Turnkey Contractor	Turnkey Contractor, with Input from Owner	Turnkey Contractor	Turnkey Contractor for Owner; and U.S. DOT	Turnkey Contractor	Turnkey Contractor

intermediary once the turnkey contractor progresses, special efforts are required by all to ensure that design changes are executed in ways that are consistent with previous environmental commitments made earlier in the planning process is required. Environmental monitoring compliance efforts by the owner and U.S. DOT need to incorporate mechanisms for identifying and resolving environmental issues caused by late design changes quickly and efficiently so that delays are minimized and the potential benefits of a turnkey procurement can be realized.

Super Turnkey Procurement

In a super turnkey procurement, the balance of responsibility for environmental management shifts from the owner to the turnkey contractor. While the owner still maintains responsibility for the preparation of NEPA documentation and environmental compliance monitoring, the turnkey contractor role in designing mitigation and managing environmental risk is increased. As this responsibility shifts, the early identification and resolution of environmental issues at the project outset becomes increasingly important to avoid the potential for change orders (and resultant project delays and cost increases) caused by environmental "surprises."

Four Phase Turnkey Procurement

A variation on a superturnkey procurement, four phase turnkey calls for greater participation of the turnkey contractor in the preparation of project NEPA documentation. The attraction of doing this from an environmental standpoint is that this provides the turnkey contractor with a better overall understanding of environmental commitments, which can be carried forward through project implementation. However, a consideration requiring careful attention under this procurement type is the potential for conflict of interest, as the Council on Environmental (CEQ) regulations preclude the entities responsible for NEPA document from having a financial interest in the project outcome.

Franchise Procurement

In a franchise procurement, the turnkey contractor assumes the environmental management responsibilities (and the associated risks) typically assumed by the owner in a traditional procurement. Unlike the agency owner, the turnkey contractor is unwilling to assume risks associated with environmental issues without translating that risk into increased costs. The greater the level of uncertainty with respect to environmental issues, the higher the perceived environmental risks and hence the greater the increase in procurement cost. For this reason, when considering a franchise procurement through environmentally constrained areas, it is important to understand potential effects on SEE factors as early as possible so that the costs of the procurement are not artificially inflated by perceived risks. Lowering the risk is also important to reducing the probability of change orders, so that time savings in schedule and costs can be realized.

As in Four Phase Turnkey, the potential for conflict of interest must be carefully managed. This is even more true in a franchise procurement where the turnkey contractor has lead responsibility for the preparation of NEPA documentation and the monitoring of environmental compliance.

ENVIRONMENTAL MANAGEMENT ISSUES IN TURNKEY PROCUREMENT

Turnkey procurements raise a number of environmental management considerations which should be identified and incorporated into the planning for and the design of the procurement process. These are:

- Assignment of Responsibility
- Potential for Conflict of Interest
- Environmental Issues Management
- Monitoring Late Changes in Project Definition
- Sequencing of Activities
- Mitigation Monitoring
- Public Relations
- Quality Assurance

Mechanisms designed to address these considerations must be responsive to the three complementary but sometimes distinct viewpoints of U.S. DOT, the local agency owner, and the turnkey contractor. While each of these players has an ultimate interest in ensuring the success of the venture, the measures by which success is measured and the motivation for addressing these environmental management issues are somewhat different. Environmental considerations in turnkey projects are summarized in Table 2, along with a snapshot of the perspectives of the three key participants and possible solutions for managing potential conflicts.

TABLE 2. ENVIRONMENTAL CONSIDERATIONS IN DESIGN-BUILD PROJECTS

ISSUE	U.S. DOT CONCERNS	LOCAL OWNER CONCERNS	DESIGN-BUILD CONTRACTOR CONCERNS	POSSIBLE SOLUTIONS
Assignment of Responsibility	DOT wants decisions/commitments made by party with legal and/or equity responsibility	Does not want political heat for decisions not made by agency board	Does not want delays and costs which he can not control	Always make the owner fully responsible for the NEPA document preparation and definition of mitigations, even if turnkey contractor contributes ideas
Potential for Conflict of Interest	Wants independent monitoring of environmental compliance	Wants avoidance of costs to local owner; but full environmental compliance	Wants to avoid environmental requirements which will impact costs and schedule	Make owner (and U.S.DOT) responsible for monitoring environmental compliance, either with their own staff or with contracted environmental support firm
Environmental Issues Management	Does not want unexpected surprises	Does not want sudden, unexpected cost increases or political repercussions	Does not want sudden, unexpected cost increases or schedule delays	All parties want risks managed. Special attention should be paid to major risk areas to avoid bad effects
Changes in Project Definition; Late Design Changes after EIS	Wants all such changes reviewed for environmental impact and dealt with appropriately	Wants to avoid process delays, cost increases, legal challenges, but wants flexibility to address major new issues	Wants to avoid process delays, cost increases, legal challenges	Provide separate contingency budget for dealing with design changes, which may still be needed even with good risk avoidance/management
Sequencing of Activities	Wants Record of Decision before project gets go ahead; wants environmental compliance follow-through during design and construction	Wants to obtain project acceleration and cost savings from telescoping design and construction	Wants flexibility to make design change decisions during construction without environmental process delays	Risk management, and contingency budget, as defined above
Mitigation Monitoring	Wants independent monitoring of environmental compliance - no lawsuits!	Wants environmental compliance and no legal hassles, but no cost/schedule impact on contractor	Want as much advance notice as possible of environmental issues needing response, wants to minimize cost of mitigation	Explicitly include mitigation in original contract requirements; owner should monitor with own staff or contracted services
Public Relations	Wants public to be satisfied - no controversy	Wants no public controversy-requires staff to communicate - who is contractor or owner	Wants no public controversy - not usually good at public relations, communications Wants no delay or added costs to conduct public relations	Owner should handle sensitive public relations, including construction outreach; but contract with turnkey must also spell out some expectations
Quality Assurance	Wants full follow-through on design and mitigation expectations	Wants full follow-through on decision and mitigation expectations	Wants to ensure proper design, to avoid operations problems which will mean legal/cost liability to contractor	All parties have a stake in quality assurance. Contract must identify role of each party, including federal oversight, owner QA monitoring, and turnkey contractor responsibility

ENVIRONMENTAL MANAGEMENT LESSONS LEARNED UNDER TRADITIONAL AND TURNKEY PROCUREMENTS

A number of lessons can be learned from recent experience in projects using both traditional and turnkey procurements. This section is based largely on the experiences of the example projects described below. Approaches these projects have taken in dealing with the environmental management issues raised in the previous section are described, pointing to ways in which the environmental process can be tailored to deal with those issues.

Traditional Procurement - Salt Lake City Light Rail (LRT)

This $315 Million project, which is currently completing final design and will soon start construction, involves a 15-mile at-grade light rail line, most of which is in a railroad right-of-way purchased by Utah Transit Authority (UTA).

The major environmental challenge during the preparation of the Final Environmental Impact Statement (FEIS) by UTA was providing for the project design changes later almost sure to occur after completion of the FEIS. This was because UTA does not have eminent domain powers, and must negotiate for the acquisition of right-of-way parcels without the ability to condemn. Even as final design nears completion, there are still some station parcels not acquired, and changes in at least one station location may require a hazardous materials survey and preparation of a remediation plan. However, it does not now appear that any design changes will require a supplemental EIS. Right-of-way acquisitions will be complete before construction contracts are awarded.

The major lesson here is that contingencies must be provided in the project budget and schedule to deal with inevitable project design changes. This is true in conventional procurement, but more so in turnkey procurement options. If the Salt Lake project were a turnkey procurement rather than a traditional procurement, the uncertainties about final design in connection with right-of-way acquisitions would be a cost risk to the contractor, and it would be important for the owner to acknowledge the risk and provide for a way to deal with it. The absence of such planning or acknowledgment could result in a major legal/contractual challenge later on.

Limited Turnkey Procurement - Portland Westside LRT

The Portland Westside transit project is an 18-mile light rail extension which includes twin-bore 3-mile tunnels and an overall project budget of $944 Million. The project used three distinct contracting techniques: competitive low-bid for the majority of civil construction contracts, including the tunnel section; negotiated (Request for Proposals) for three civil packages, including one line section; and design-build for a park and ride structure.

Construction outreach is being handled by the owner, Tri-Met, not by the contractor. This is true for all three procurement techniques. Construction outreach was a very significant issue in one

line section because of business losses and neighborhood concerns relating to noise and traffic. Noise was of particular concern in the tunnel section. While the line and tunnel were traditional procurements, Tri-Met's experience on those sections, as well as on the limited turnkey contracts, lead to the conclusion that it would not have been wise to leave community outreach to the contractors. Because the contractors had no equity interest in the project and no long-term operational responsibility, there was no particular motivation for them to ensure continuing good relationships with project neighbors through providing a comprehensive and continuous program implemented by personnel skilled in public outreach. The contractor's primary interest was construction cost, schedule and the end-result product, not the perceptions and "feelings" of the affected community. This function was much better handled by Tri-Met, who as a public agency does have the direct responsibility to answer to complaints, and the expertise available to effectively manage sensitive issues in the community.

This project also illustrates how environmental considerations and the prospective impacts of the undertaking might influence the selection of an appropriate procurement option. Because of limited potential for environmental impacts, Tri-Met elected to complete the park-and-ride facility as a design-build procurement. The more environmentally complex and controversial linear elements of the project were handled in a traditional process.

Turnkey Procurement - Houston METRO Fixed Guideway Project

In 1990, Houston METRO decided to proceed with a modified turnkey procurement for a fixed guideway system of a specific length alignment (approximately 21 miles) and performance requirements, estimated to cost not more than $1.1 Billion (1990 $). Contractors/suppliers of fixed guideway equipment were encouraged to respond first with Letters-of-Interest and Qualifications. Then METRO prepared and issued Requests for Proposals to those interested and qualified. Each proposer was asked to submit priced proposals for the design and construction of the system, describing the technology (guideway and vehicles) which they would use.

Responsibility for the preparation of the Draft and Final EIS for the project was retained by Houston METRO, but was planned to be completed simultaneously with and parallel to the design work by the selected turnkey contractor. It was intended that after the public hearings on the selected turnkey contractor's proposed system necessary to complete the DEIS, the METRO Board would select it as the locally preferred alternative, then award the Preliminary Engineering phase of the contract to the turnkey contractor. The FEIS would be completed during the Preliminary Engineering phase. After a Record of Decision, METRO would award the fixed-price turnkey contract and the turnkey contractor would proceed with final design and construction.

The above described process went forward to the preliminary engineering/FEIS phase, but for a variety of political reasons did not reach the completion of that phase and award of a turnkey contract. However, some lessons were learned in the process (some of which were later used to refine the procurement process for Honolulu).

The central issue was commitment. METRO could not legally commit to go forward with the project (using federal funding) until the Record of Decision. However, the turnkey contractor was asked to spend a considerable amount of time and money on conceptual design, on the hope that the commitment would be there. Because Houston chose to let alternative technology suppliers propose, it was not possible for METRO to develop the EIS without the turnkey contractor's involvement. When METRO chose not to proceed with the project, the experience left a widespread negative perception among the competitors.

Superturnkey Procurement - Minneapolis LRT

In Hennepin County, Minnesota, the Regional Railroad Authority pursued development of a 29-mile light rail system through a superturnkey approach. A consortium would be retained to implement the entire project and to provide some of the local financing by sharing with the owner some of the revenue derived from value capture on land development around stations. The project proceeded only through the initial Letter of Interest and Qualifications stage, and is inactive at this time.

During the time the project was active (1989-1991), the Hennepin County Regional Railroad Authority (HCRRA) completed preliminary engineering and environmental documentation under Minnesota state environmental laws which closely parallel NEPA. However, a federal EIS under NEPA was not pursued, because federal Section 3 New Start funds were not included in the project funding.

The HCRRA completed preliminary engineering and the requisite state "little NEPA" environmental documentation and thereby provided a solid basis for the turnkey contractor to propose on the contract without a heavy risk. It would also have avoided the potential for conflicts of interest, and given HCRRA a solid understanding and measurable basis for monitoring environmental compliance.

Four-Phase Turnkey - Honolulu Rapid Transit

In 1990, the city and county of Honolulu issued Requests for Proposals to design, supply, construct, operate and maintain a fully-automated and grade-separated rapid transit system meeting specific performance requirements and on a specific alignment. Approximately $1.7 Billion was been set aside for the total program.

The Requests for Proposals were to select a single turnkey contractor to proceed with Phase 1 (Preliminary Engineering). Phase 2 (Final Design), Phase 3 (Construction), and Phase 4 (Operations and Maintenance) would follow. Like the Houston process, the Honolulu procurement called for the owner to complete the EIS during preliminary engineering, but the Honolulu approach also called fur substantial turnkey contractor input to the owner's work on the EIS. The Honolulu approach also provided a significant owner participation in the costs of preliminary engineering ($2 Million).

The Houston approach did not involve signing the final design build contract until the end of Preliminary Engineering, after the EIS Record of Decision. The Honolulu contractor signed the phased contract at the start of Preliminary Engineering. Because of this and because of the level of turnkey contractor involvement in preparation of the FEIS during Preliminary Engineering, the potential for a conflict of interest under the Council on Environmental Quality (CEQ) rule that major preparers of the EIS have no substantial financial interest in the project had to be carefully managed.

Ultimately the Honolulu project did not advance. Support evaporated in part because the station locations and designs had not been fixed and the project lacked a supportive local constituency. The situation was further complicated by the contractor's unwillingness to make design changes which would appease adjacent communities but would increase costs. This again signals the importance of allocating contingencies to resolve environmental and community issues. The required number of votes on the Honolulu City Council to approve the phased turnkey contract could not be mustered, even though the selection had been made and a contract negotiated. As in Houston, the situation left a negative perception which could have the potential to drive up future bids.

Design, Build, Operate, Maintain (DBOM) - Hudson-Bergen LRT

New Jersey Transit has selected a single contractor for a DBOM procurement for the first ten-mile segment of a $350 Million project along the Hudson River Waterfront. The Final EIS has been prepared for the project , and is currently under review for a Record of Decision from FTA. The project also has a solid 30 percent preliminary engineering design in place, completed along with the FEIS by the owner, New Jersey Transit. The project is one of five included in FTA's Turnkey demonstration program. Because the DBOM contract work is just beginning, environmental compliance management success or conflicts and resolution of community issues remain to be seen. However, the completion of Preliminary Engineering and FEIS by the owner prior to DBOM procurement appears to be an important factor in permitting a successful start, somewhat in contrast to Houston and Honolulu.

Franchise -- Orange County, CA Toll Roads

Two toll road projects, the San Joaquin Hills and Foothill/Eastern, each involving approximately $1 Billion in capital costs, are the first public toll road projects in California. The Transportation Corridor Agency (TCA) in each case completed the EIS and environmental permitting under the California Environmental Quality Act (CEQA), which closely parallels NEPA. Because of environmental process lawsuits (resolved in the San Joaquin Hills case, and pending on Foothill/Eastern), contingency funds were provided to cover delay effects on costs. The setting aside of such contingencies is one mechanism of acknowledging uncertainties in the environmental process and avoiding unnecessary assumption of risk by either the project sponsor and the turnkey contractor.

TAILORING THE ENVIRONMENTAL PROCESS TO SUPPORT TURNKEY PROCUREMENT

Using the NEPA Process for Proactive Environmental Management

Proactive management of environmental issues is one of the best ways to avoid cost overruns and schedule delays, and to enable projects to benefit from innovative procurement strategies. When integrated into the project planning and engineering design process, the NEPA process can be used to identify and resolve community and environmental concerns early in the project development process. This early resolution of environmental issues can avoid environmental uncertainties (thereby limiting risk), eliminate backtracking, reduce the need for change orders, and help maintain project budgets and schedules by avoiding last minute reactive changes to resolve outstanding environmental concerns. Because of the open, public nature of the NEPA process, it also provides a good opportunity to build a constituency for proposed undertakings, which can be a important resource in ensuring successful implementation. Finally, the NEPA process can be used to generate an "environmental roadmap" for the project which can be used as a management tool throughout the construction process. The key to achieving this is to produce documentation and record commitments in a way that is easily referenced and understood, with an emphasis on graphic as opposed to narrative format.

Assignment of Responsibilities and Timing of Contractor Involvement

Assigning responsibility for environmental management functions to the parties who are best equipped to resolve the issues that are likely to arise at each stage of the project development process is important. The potential distribution of responsibilities among the U.S. DOT, the owner, and the turnkey contractor under alternative procurement scenarios are summarized in Table 3. This distribution of responsibility varies somewhat from what has typically occurred or has been proposed in the past. Most notably, the owner should consider maintaining responsibility for three key environmental management functions, regardless of the procurement type: preparation of NEPA documentation; public outreach; and evaluation of environmental impacts associated with design changes. This is consistent with the findings contained in the FTA report entitled ***Turnkey Procurement Opportunities and Issues*** (June, 1992):

"No evidence has been found in reviewing project experiences that the private sector can resolve environmental, community and political concerns regarding a project's feasibility or desirability more readily than the public sector."

Only the agency owner, as a steward of the greater public interest is in a position to fairly balance the potentially conflicting objectives of reducing cost, maximizing system performance, minimizing environmental impacts and maximizing public acceptance.

The actual timing of contractor involvement in the project development process is a secondary consideration to the distribution of responsibilities. However, providing opportunities for

contractor participation as early as possible in the project development process can help maintain continuity throughout the project and ensure that environmental commitments are met. The challenge is how to engage the contractor in the process without requiring the contractor or the agency to bear a disproportionate share of risk because of the greater uncertainties early in project development. One approach would be to base the initial contractor selection based on qualifications and possibly unit prices, followed by negotiation of a firm, fixed price after completion of environmental documentation and definition of mitigation needs.

Innovative Approaches to Environmental Management

Innovative approaches to environmental management which could benefit turnkey procurements could include the following:

- Performance standards could be used to encourage avoidance of protected resources and community features through the use of financial incentives. Since the best environmental mitigation is avoidance, the approach would have great appeal to resource agencies and communities alike.

- Development of area-wide "enhancement banks" to which turnkey projects could make a financial or "project" contribution to satisfy mitigation needs. These banks could formed in consultation with local communities and area resource agencies, and would include undertakings (such as streetscape improvements or parkland/natural areas acquisition) identified in local plans or resource management plans. The advantage to a turnkey contractor would be the ability to select from a menu of pre-defined activities already embraced by the community with known costs which might be suitable as mitigation.

- Development of programmatic agreements with key federal and state resource agencies (such as U.S. Army Corps of Engineers or the National Park Service) at the project outset to increase control over public agency review periods and to streamline documentation requirements. As part of this process, agencies can be educated to the overall objectives and special needs of turnkey projects.

TABLE 3. POTENTIAL FUTURE ROLES AND RESPONSIBILITIES

Environmental Management Functions	Who Completes NEPA Process?	Who Designs Mitigations?	Who Determines Sharing of Costs/Risks?	Who Obtains Needed Permits?	Who Monitors Environmental Compliance?	Who Conducts Construction Impact Outreach?	Who Evaluates Late Design Change Environmental Impacts?
Traditional Procurement	Owner, for U.S. DOT	Owner	Owner	Owner	Owner and U.S. DOT	Owner	Owner
Limited Turnkey	Owner, for U.S. DOT	Owner	Owner	Owner	Owner and U.S. DOT	Owner	Owner
Turnkey	Owner for U.S. DOT	Owner	Owner and Turnkey Contractor	Turnkey Contractor	Owner and U.S. DOT	Owner	Owner
Super Turnkey	Owner for U.S. Dot	Owner and Turnkey Contractor	Owner and Turnkey Contractor	Turnkey Contractor	Owner and U.S. DOT	Owner	Owner
Four-Phase Turnkey	Owner (with input from Turnkey Contractor)	Owner and Turnkey Contractor	Owner and Turnkey Contract	Turnkey Contractor	Owner and U.S. DOT	Owner	Owner
Franchise	Owner (with input from Turnkey Contractor)	Owner and Turnkey Contractor	Owner Turnkey Contractor	Turnkey Contractor	Owner and U.S. DOT	Owner; or Turnkey Contractor by Agreement	Owner

CONCLUSIONS AND RECOMMENDATIONS

Environmental issues associated with major transportation investments pose a risk management challenge in both traditional and turnkey procurements. The major project risk factors related to the environmental process involve cost risks, delay risks and public relations risks.

Cost Risks - Cost risks (other than delay costs) are most likely to be related to the following SEE factors: hazardous materials, subsurface geological conditions, wetlands, noise, parklands, historic/archaeological resources, community disruption and property acquisition. Any of the above situations not adequately known or identified in the NEPA process, and subsequently discovered or developed as a result of significant public controversy in final design or construction has the potential to result in major changes to project costs. These risks are largely not controllable by a turnkey contractor and thus should not be assigned to the contractor in a turnkey procurement.

Delay Risks - In addition to the risk of increased construction costs, failure to identify and address any of these factors early in the project development process can result in significant project delay. Project delay is a source of cost increases in an inflationary economy, mobilization/demobilization costs, and costs associated with staff "downtime". Other delay risks include administrative or legal procedural challenges and permit approvals.

Public Relations Risks - Because most major transportation projects -- highway or transit -- have some opponents, any action which appears insensitive to public perceptions and concerns can quickly ignite controversy. This is particularly true of environmental issues, many of which can provide opponents with the opportunity for legal challenge. The public is particularly sensitive to proposed changes to the existing character of an area, and to construction impacts. Since mitigation measures for both of these elements tend to be only generally described in NEPA documentation, outreach to maintain open communications and resolve problems is important throughout all phases of the project, but particularly during construction. These risks are at least partially controllable by the turnkey contractor, and it may be appropriate to share them between the owner and the contractor. Proactive planning early and continuously throughout the project development process can minimize the impacts of these risks.

Independent of whether a traditional or a turnkey procurement method is selected, all of the above project risk factors need to be considered. However, for some risk factors there may be advantages in the turnkey contract approach, while for other risk factors turnkey may have disadvantages. The key to making the environmental process support a turnkey approach is to capitalize on the flexibility and advantages of a turnkey approach while reducing the potential for major project risk factors to jeopardize successful project implementation. Mechanisms to compensate for potential disadvantages of an innovative procurement process for each of the major risk factors need to be developed and incorporated into the design of the turnkey procurement process. Major risk factors should be identified and acknowledged as early as

possible. Responsibility for risk management and resolution of issues arising from these factors should be assigned to the parties best equipped to resolve the particular situation.

BIBLIOGRAPHY

Callahan, J.T., *Use of Alternate Dispute Resolution in Transit Construction.* High-Point Schaer. Paper presented at American Public Transit Association (APTA) Rapid Transit Conference, Los Angeles, June 1992.

Cobb, M.A., *Transit Total Quality Management.* Long Island Railroad. Paper presented at APTA Rapid Transit Conference, Los Angeles, June 1992.

Cushman, R., and K.S. Taub, *Design-Build Contracting Handbook.* John Wiley & Sons, Inc., New York, 1992.

Design/Build: A New Approach, Turnkey Demonstration Program: Implementation Strategy. (Brochure). FTA, U.S. Department of Transportation, undated.

Design-Build Instructions (DBI) for Military Construction. Report CEMP-EA (a "Living Document"). Directorate of Military Programs, U.S. Army Corps of Engineers, October 29, 1994. Also available through Construction Criteria Base (CCB) CD-ROM, National Institute of Building Sciences, Washington, D.C.

Devine, J.W., *Project Controls: Facts and Myths.* O'Brien-Kreitzberg & Associates, Inc. Paper presented at APTA Rapid Transit Conference, Los Angeles, June 1992.

Elms, C.P., *Comparison of the Super-Turnkey Procurement with the Traditional Approach for the Design and Construction of Fixed-Guideway Transit Systems.* Lea & Elliott, Inc. Paper presented at APTA Rapid Transit Conference, Los Angeles, June 1992.

Gallegos, L.S., *The Importance of a Project Management Plan and Follow-On Team Building for Ensuring a Project's Success.* L S Gallegos & Associates, Inc. Paper presented at APTA Rapid Transit Conference, Los Angeles, June 1992.

KPMG Peat Marwick LLP, *Turnkey Financing for Public Transportation Projects.* (Draft Report). FTA, U.S. Department of Transportation, 1996.

Lee, D.B., T.M. Sheehan, P.A. Mattson, and R.J. Lobron, *Turnkey Evaluation Guidelines.* Volpe National Transportation Systems Center, (Final Draft). FTA, U.S. Department of Transportation, March 1995.

Luglio, T.J., Jr., and J.A. Parker, *Turnkey Procurement: Opportunities and Issues.* Report FTA-MA-08-7001-92-1. FTA, U.S. Department of Transportation, June 1992.

Mini Forum on Transit Turnkey Development: Meeting Report. Meeting conducted by American Society of Civil Engineers for FTA, U.S. Department of Transportation, February 23, 1993.

Salpeas, P.T., and K.K. Mayo, *Partnering In Rail Transit Construction.* Bay Area Rapid Transit District Extensions Program - Development. Paper presented at APTA Rapid Transit Conference, Los Angeles, June 1992.

Schneck, D.C. and R.S. Laver, *Evaluation of Houston's Turnkey Experience.* Report FTA-MD-26-0001-94-1. FTA, U.S. Department of Transportation, July 1994.

Turnkey Demonstration Program: Expert Roundtable Workshop on Techniques for Successful Design/Build for Transit. (Synopsis of Highlights). FTA, U.S. Department of Transportation, March 4, 1994.